Technol
C.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, JANUARY 6, 1916 No. 1

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

CANADIAN MACHINERY

PETER BAIN, M. E., Editor.

Associate Editors.

A. G. WEBSTER. J. M. WILSON. J. H. RODGERS.

B. G. NEWTON - - - - - Advertising Manager

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—London, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 140 So. Dearborn St., Room 607, Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

High Explosive Shell Manufacture

Staff Article

Instances have been numerous throughout the country where plants have had to be greatly extended in order to cope with the demand for war material. Certain lines of industry have not been forced to extend so much as others, and in the following article is described a 4.5 in. shell plant which found convenient accommodation in a disused power house.

4.5 SHELL PRODUCTION IN A SHIP-BUILDING PLANT

OWING to the difficulty of obtaining delivery of new tools in reasonable time, this plant was equipped with such existing machines as were suitable for handling 4.5-in. howitzer shells, new machinery of special design being installed when available.

The forgings are received in the rough state and all subsequent operations are performed necessary to prepare the shell for receiving the charge of explosive, and being assembled with the cartridge case.

The manufacture of this size of shell (4.5-in.) was undertaken after all the available factory space had been occupied with shrapnel. The building in which the work is carried in was formerly a power house, 100 ft. x 50 ft. The adoption of hydro-electric power supply enabled the necessary electrical apparatus to be concentrated in a space 20 ft. wide across one end of the building. The height of the building was ample to allow of adding a floor, thus more than doubling the floor space. The result has been the development of a 4.5-in. department which, though limited in size of equipment, is producing shells in a satisfactory manner both as regards quality and quantity.

The general arrangement of the shop is shown in Fig. 1, which gives plans of the ground floor and first floor respectively.

Rough forgings are received at the south end of the building where ample space has been left for handling material. The work is elevated to the first floor by means of an electric hoist running on a track, the opening in the upper floor being immediately above the door mentioned. The space on the ground floor underneath has accordingly to be kept amply clear for reasons of safety.

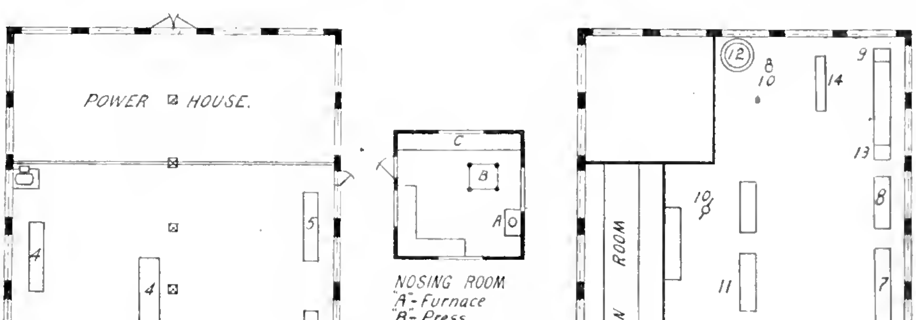


FIG. 1. LAYOUT OF PLANT SHOWING LOWER AND UPPER FLOORS.

1—Cutting-off. 2—centering on drill press. 3—Rough turning lathes. 4—Turret boring lathes. 5—Machining nose. 6—Finish turning to profiles. 7—Recessing base. 8—Threading base. 9—Grooving and waving. 10—Tightening and riveting plugs. 11 — Facing-off plugs. 12—Banding press. 13—Band turning. 14—Name marking. 15—Enamelling tank. 16—Baking oven. 17—Painting bench.

Cutting-off and Centering

A "Hall" cutting-off machine is used for trimming both base and mouth of forgings. In accordance with recognized practice, the shell is positioned with the inside of the base against a stop-rod held inside the hollow spindle, and the base is machined off to the necessary thickness, two cutting tools being employed. After a suitable number of forgings have been faced, the positioning rod is readjusted and the shell inserted base first so that the open and is now in position to be trimmed, leaving the forging ready for centering.

Centering is performed accurately and quickly on a small "Aurora" drill press equipped with a centering arbor of the tilting type. This machine, along with the cutting-off machine, is shown in Fig. 2. The arbor is fitted with three flat spring strips which approximate closely to the shape of the inner surface of the shell. A horizontal arm with adjustable counterweight maintains the forging in a vertical position while being centered, any readjustment from

time to time being obtained by moving the counterweight along the inclined face on which it rests. In placing or removing the shell, the arbor is tilted to a horizontal position, as shown in the illustration.

FIG. 2—CUTTING-OFF MACHINE AND DRILL PRESS WITH CENTERING ARBOR

Rough Turning

The machines employed on rough turning are a 26-in. "New Haven" engine lathe and a 30-in. "C. M. C." engine lathe. The latter machine is fitted with a simple cross-slide on the carriage, supporting a square tool box of the four-tool type, which has been so largely adopted by shell makers for the simpler operations. The absence of a compound rest gives increased stiffness to the structure and enables the heaviest possible cuts to be taken without any signs of distress.

The forgings are mounted on an expanding arbor with two sets of driving dogs, the mechanism being operated by a hand-wheel at the tail end of hollow spindle. These arbors give excellent service and no trouble has been experienced at any time with forgings slipping under heavy cuts.

The shell is turned to the dimensions shown in Fig. 3, the base being finished, while a finishing cut is left on the parallel portion, and suitable material on the part which is formed in the nosing operation.

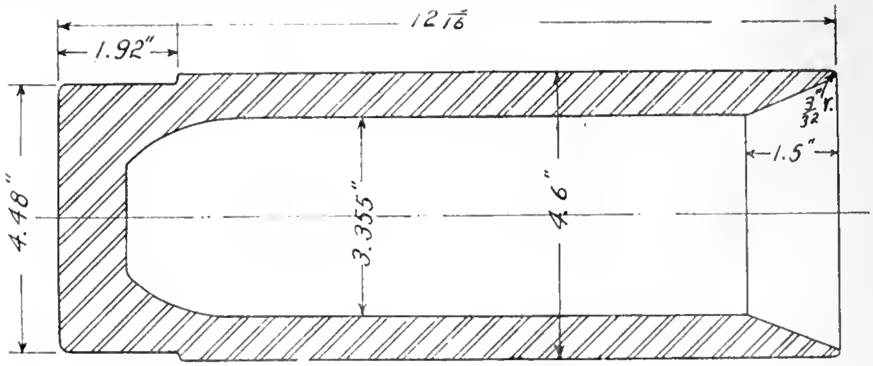


FIG. 3. DIMENSIONS OF SHELL FORGING WHEN ROUGH TURNED READY FOR NOSING.

Boring

The machining of the interior is divided amongst three machines. Two of these are "American" turret lathes which do the boring proper, while a "Gisholt" turret lathe is used for putting the proper outline on the nose. The shells are held in a large split sleeve chuck tightened by means of two bolts. The parallel portion is rough bored by a single tool bar of ample stiffness, and the bottom roughed out by a notched-formed cutter. Finish reaming on both portions completes the work of these machines.

The shells are next held in a similar chuck while the outer edge of the mouth is well rounded off to facilitate the action of the nosing die, and the inside of the mouth is deeply countersunk so that when the nose is formed, the closed-in material leaves a practically parallel hole of desired size to admit the boring tools used in finishing the nose.

The heating furnace and hydraulic press for closing in the nose are conveniently located in a separate building about 15 ft. square, formerly used for storage purposes. This minimises the fire risk, which would be incurred through installing the furnace in a shop with the usual amount of woodwork in the shape of floors and partitions.

An oil burning furnace made by the Tate-Jones Co. is installed along with a "Southwark" hydraulic press of the ordinary vertical four-column type with ram below the lower platen. An annealing bed of ample capacity occupies one side of the nosing room, the general layout of which is shown in Fig. 1.

FIG. 4 GROUND FLOOR OF BUILDING WHERE ROUGH MACHINING IS PERFORMED

Finishing the nose

The nosed-in shells are now returned to the machine shop where the nose is finished. This consists of four operations, viz., boring, facing to length, beveling mouth, and tapping. Two 26-in. lathes built by J. B. Reed are engaged on this work, seven-hole turrets being mounted on the standard carriage in

place of ordinary tool slides. Four tools are carried in these turrets, performing the operations in the order mentioned

FIG. 5—VIEW OF NOSING PRESS AND HEATING FURNACE

above. Collapsing taps are used to advantage on these machines, the type adopted being that made by the Manufacturers Equipment Co.

The completion of this operation terminates the amount of work done on the lower floor, the remainder of the work including enamelling and painting, being completed on the upper floor.

Finishing the Outside

Two 26-in. engine lathes are engaged in machining the outer diameter of the shell to the required size and shape. These are built by Prentice Bros. and Edwin Harrington & Co., and are fitted with sleeve chucks which grip the base end of the shell where it was finished to size during the rough turning operation. This finished diameter acts as a gauge for setting the finishing cut quickly and accurately. A centre plug is screwed into the threaded nose to allow the tailstock to support that end of the shell.

Profile bars of the now familiar type are used for controlling the movement of the tool, suspended counterweights keeping the tool guide up to the copy.

An old Gisholt lathe of an early design has been pressed into service and is doing good work recessing the bases preparatory to being threaded.

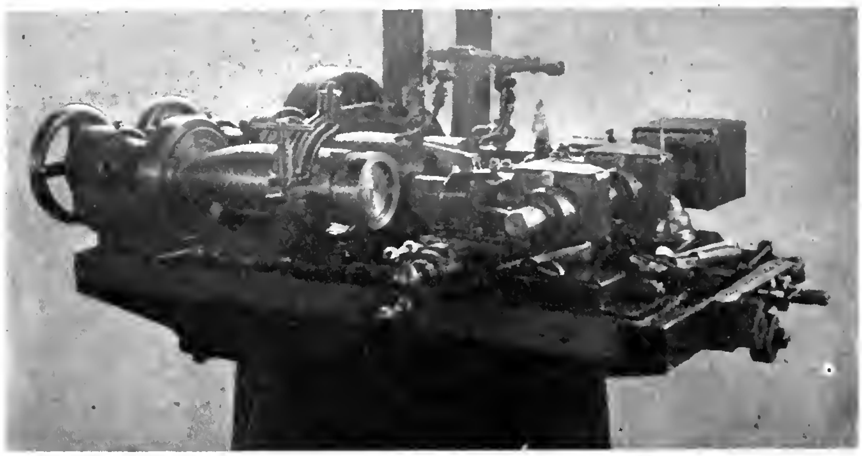


FIG. 7 DUPLEX AUTOMATIC THREAD MILLING MACHINE

Threading Base Recess

A duplex automatic thread milling machine is used for forming the thread in the base. This machine is illustrated in Fig. 7 and consists of a box-form bed on which are mounted at the left two driving spindles fitted with draw-in collet chucks. These chucks hold driving plates, in the centre of which is a threaded boss on to which the nose of the shell is screwed. The two shells are supported in a double steady rest. At the right of the machine are the cutter arbors, which are mounted in sliding carriages travelled by gearing to suit the pitch of the thread, the shell meanwhile being revolved at the necessary rate by means of suitable gearing.

Owing to the use of long cutters, which steady the cutting teeth, the pitch of the thread is maintained accurately. Should occasion arise when a thread is not exactly to gauge, it is corrected by using a Pratt & Whitney adjustable tap.

Inserting Base Plates

The shells are now ready to receive the base plates, the threads being coated with red lead cement to insure a tight joint. The shells are held in a vertical chuck mounted in a pedestal secured to the floor, the tightening of the plate being done by two men who use a long double-ended wrench and pull till the square boss on which the wrench fits is twisted off. The stress necessary to do this insures a satisfactory degree of tightness on the thread.

The riveting of the plate around the joint is done with a pneumatic hammer and caulking tool, a heavy sleeve with an opening of the required size being slipped over the inverted shell. This sleeve guides the caulking tool around the joint and permits the operator to give his entire attention to the action of the tool, see Fig. 8.

FIG. 6 VIEW OF UPPER FLOOR

Machining the Groove

Grooving, undercutting and waving are performed on a J. B. Reed lathe fitted with "Bertram" attachments which have been frequently mentioned in connection with shell manufacture.

The base is now faced off in a "Hall" cutting-off machine after which the

nace. During the last two or three years rapid strides have been made with the duplex or Bessemer-open-hearth process, and costs are being obtained which compensate for the excessive metal loss in the Bessemer part of the process.

It may be that the duplex process in connection with either the basic or acid electric furnace will give us the solution. However, enough has been already done with the manufacture of the heavier or lower priced products to indicate that, provided it is turned out in producing units of equal size, the total cost of electric steel will be near enough to that of open-hearth steel, so that the manufacturer can afford to stand the difference in order to give the consumer quality, the requirements for which are constantly growing more rigid.

The possibility of bringing the cost of the two steels near together will appear more feasible if we consider such incidental savings as the use of cheap pig iron at the beginning of the process and the smaller discard of rolled product due to having an ingot free from segregation.

Electric Furnace in Germany and France

In Germany, Luxembourg and eastern France, the electric furnace is the best apparent solution of a condition which is a menace to the steel industry of those countries. While the high phosporus ores of Luxembourg and Lorraine, together with the basic Bessemer process, made possible the great steel development of Germany, the quality of basic Bessemer steel does not to-day give it a standing with open-hearth steel, while the demand for better quality is daily growing. On the other hand, basic Bessemer steel, after refining in the electric furnace, is superior to open-hearth steel. The manufacture of electric steel by this method was begun in Germany several years ago, and has in moderate quantities been made into all kinds of steel products. It seems probable that the American steel manufacturer will find it necessary to adopt electric steel to meet the competition which he will meet in the world's markets.

Fast Progress in America

It has been remarked that the process of electric steel manufacture in America has been slow as compared with that in Europe, but the indications are that this relation will soon be reversed. It was natural that the invention of the electric furnace should be made in countries where cheap hydroelectric power was already in extensive use for other electrochemical processes, but it was only a couple of years before the first electric furnace was installed in the United States. We must also remember that the first large furnace, namely, one of 15 tons capacity, requiring electrodes 2 ft. in diameter, a then unheard of size for steel furnace use, was built here; also that this furnace was the first to use 3-phase electric current, which adapted it to utilize the kind of current in general commercial use. There are now (September) either built or building over 40 electric furnaces in America, of which there are 27 of the Heroult type alone. The average size of these furnaces is also greater than the average size in Europe. These figures have however, been considerably exceeded in the last three months, says the Iron Age, to which we are indebted for this condensed statement of the Author's views.

If the electric furnace be used for the further refining of steel made in present installations of the older processes, as now seems probable, the amount of electric steel produced should then eventually be commensurate with that now being produced by those processes; and it follows that "electric steel production in the United States will exceed that of any other country."

TUNGSTEN

By Roy C. McKenna.*

THE greatest use of tungsten is as an alloy of high-speed steel: that is, of steel used for making tools for metal turning lathes running at high speed, to which tungsten and chromium impart the property of holding its temper at higher temperatures than will carbon steels. In such steels, from 16 per cent. to 20 per cent. of tungsten is used. The use of tungsten in magnet steel has consumed large amounts of tungsten; however, probably 90 per cent. of all tungsten ore mined is used in the manufacture of high-speed steel.

Tungsten Ores and Their Location

Tungsten ore is mined in many parts of the world. Its production in the United States has been recorded only since 1900; before that time, the amount mined was insignificant. There are four kinds of tungsten ore, known as Ferberite, Wolframite, Hubnerite and Scheelite. All of these are mined in the United States.

Ferberite ore is a combination of iron and tungsten; Hubnerite ore, a combination of manganese and tungsten; Scheelite, a combination of lime and tungsten, and Wolframite ore is a combination of iron, manganese and tungsten.

Tungsten ore is mined in the United States, in Arizona, California, Colorado, Idaho, Nevada, New Mexico, South Dakota, Washington and Alaska. The oldest and best known tungsten mines in the world are located in Spain and Portugal. The best grade of ore and the best producing mines are found in Boulder County, Colorado. In the U. S. Geological Survey's Report on Mineral Resources of the United States, 1913, Mr. Frank L. Hess, in speaking of the Boulder Colorado field, says: "The district is unique, in that it is the only large ferberite producing district in the world." The Burma fields are the most recent, and in the year 1914 were the largest producers of tungsten ore in the world.

Tungsten ore is also mined in Australia, India, Japan, Siam, Argentina, Brazil and Peru; and although tungsten ore deposits are found in so many sections of the world, there were produced in the year 1912 only 9,654 tons (short) of 60 per cent. tungsten trioxide concentrates, or less than 10,000,000 pounds of tungsten metal. The main source of supply in the United States for scheelite ore is in California; scheelite ore is also imported from South America and Japan.

Wolframite ore is imported into the United States at the present time from Spain, Portugal and South America. In normal times large quantities of wolframite ore is imported from the Burma tungsten fields and Australia. However, the British Government has now prohibited the exportation of tungsten ore from any of the British colonies to any country except Great Britain and her Allies.

Hubnerite ore is mined in Arizona and New Mexico; but the quantity of hubnerite ore on the market is very limited.

Both wolframite ore and hubnerite ore are likely to contain copper and tin, two elements which are extremely detrimental, and must be very carefully eliminated in ferro-tungsten before it can be used in the manufacture of high-speed steel.

Ferberite ore is the best grade of tungsten ore, and has always brought a premium in price over the other grades. The only large ferberite-producing district in the world is in Boulder County, Colorado.

Mining Methods

The methods of mining all kinds of tungsten ore and the formation of all tungsten fields are similar. The writer is, however, more familiar with the tungsten fields of Boulder County, Colorado. Tungsten minerals, like tin ore, generally occur in veins cutting through granite rocks. Tungsten ore in the Boulder field is mined in veins, the vein in many cases being no thicker than a lead pencil. Again, it may be as thick as a man's arm, and in some instances, it may be as thick as a man's body. The ore in these veins contains from 3 per cent. to 10 per cent. tungsten trioxide. It is only when one vein leads into or crosses another that there is found a "pocket" of tungsten. A pocket of tungsten generally contains about one cubic foot of ore of about 65

*President, Vanadium Alloys Steel Co., Pittsburgh, Pa.

per cent. tungsten trioxide. If three or more veins meet at the same point, there may be formed a room of tungsten. A room of tungsten would contain about two cubic yards of mostly 10 per cent. tungsten ore, with several pockets of high-grade ore averaging from 60 per cent. to 65 per cent. tungsten trioxide.

Tungsten mining in the United States and in all other parts of the world is conducted with very primitive methods; in fact, for years tungsten mining has been unprofitable, for the reason that the cost of obtaining the ore has been in excess of its market value.

Investments in tungsten mines have been unattractive to conservative investors, and most large tungsten properties in Boulder County, Colorado, are owned and controlled by ultimate users of tungsten metal. The ownership of tungsten mines is only justified in securing the permanency of supply to the manufacturer of high-speed steel or ferro-tungsten. The large producing properties in Colorado are operated through lessees. It is a general practice in Colorado for the mining company to allow the lessee 75 per cent. of the market value of tungsten ore mined. With 25 per cent. the mining companies of Boulder County have furnished their lessees with electric hoists free of charge, the lessees having to pay only for the electricity used. In many of the shafts, the mine owners have furnished compressed air for drilling at or near cost to the lessee. There is, however, a fascination in tungsten mining, and there is always that gambling chance of striking a rich deposit. Owing to the small size of the tungsten vein, it is necessary to remove a great amount of dirt and rock.

In the Boulder County fields very few of the tungsten mines are profitable to work to a greater depth than 100 feet. It is a fact, however, that the deeper the mine shaft is sunk, the richer the deposit of tungsten ore. The deepest mine in Boulder County is 800 feet in depth, and, although at this depth the ore is richer, the increased cost of mining is such as to hardly justify operation.

War Conditions Increase Price

In the past year the enormous demand created for high-speed steel by the acceptance in America of large orders for war munitions, together with the prohibiting of the exportation of ore from British colonies, has increased the price of tungsten ore to five times normal. To meet the increased demand for tungsten ore, the mine owners and miners are forced to operate the least desirable veins. In the State of California there is being mined at the present time a vein of 1 per cent. scheelite ore two inches in diameter, running through solid granite, more than 800 feet under ground.

Owing to the nature of tungsten deposits, there is no likelihood of the discovery of any large fields. It is, however, a fact that upon the discovery of new fields tungsten ore is produced rapidly, owing to the fact that it can be operated as a placer mine. It is very seldom that a new tungsten field produces nearly as large a quantity the second or following years that it produces the year of discovery.

Only the Burma tungsten fields rival in production the fields of Boulder County, Colorado. The Burma tungsten fields produced and sold in past years more tungsten than Boulder County, not on account of being richer, but on account of the lack of tariff protection. The price of tungsten ore in the United States was such that mining operations could not be carried on profitably; Burma fields could operate only because of the extreme cheapness of coolie labor.

The primitive methods used in mining tungsten in the United States are not due to lack of progress, but are due entirely to the unwillingness of capital to invest the large sums of money necessary in a business of such uncertainty. Experience has taught mine owners that the temptation that lured the gold miner to lose his fortune is ever present in tungsten mining, even to a greater extent. The mine owners have adopted a safe and sane policy of allowing the men whose bread and butter depends upon production to select the vein to be worked; this leads to conservativeness otherwise impossible.

A New Industry

One of the least known, and yet one of the most important of our new industries, established through necessity occasioned by the war, is the manufacture of ferro-tungsten. Formerly the American users of this product bought their supply from foreign manufacturers. As ferro-tungsten is almost entirely used in making high-speed steel, it does not require much explanation or imagination to show the helpless position of the people of this country in event of hostilities with or between other nations. It is hoped that our Government will recognize the great value of this new industry, which, in fact, is more vital to the country than many people realize—and that Congress will afford a measure of protection to the capital already invested, so that we may continue always to be independent and safe from the menace of foreign control.

Considerable quantity of tungsten is also used in the manufacture of incandescent lamps, which are fast displacing carbon lamps. It is understood that tungsten wire may be drawn to smaller sizes than any other metal now known; it is used for contact points in spark coils, etc. Dr. Fink, of the General Electric Company, says that tungsten is well suited for standard weights, since wrought tungsten can be made so hard it will readily scratch glass and still be ductile.

Tungsten weights remain wonderfully constant; even medical science is beginning to recognize the value of tungsten. It has been suggested to use the fine tungsten wires in surgical operations, instead of the coarser gold and silver wires.

Automobile manufacturers, recognizing within the past few years that tungsten, combined with chromium, imparts to steel the quality of retaining its hardness at high temperatures, have created an unusual demand for high-speed steel for automobile valves.

Evidently the commercial possibilities of tungsten are as yet hardly touched. New uses are being found daily for this wonderful metal. Unquestionably the future has many secrets to unfold for the benefit of all mankind.

PROTECTION AGAINST CORROSION

PROTECTION against corrosion is most difficult in the case of quantities of small-size articles. A method which has been giving first-rate results in the case of buckles, rings, and harness fittings generally may help to solve this vexed question elsewhere. Cheap varnish is diluted to two or three times its volume with methylated spirits. On account of evaporation, the mixture is made up as required. The apparatus consists of two oil drums each minus one end. An ordinary 5-gallon drum, which is 11in. in diameter, has ½in. holes punched in the bottom and sides. The other drum may be of 6¾-gallon capacity, of 12-in. diameter, or a 10-gallon drum. The larger vessel is filled about one-quarter full and the articles to be treated put in the smaller vessel. The perforated drum is lowered into the liquid, immersing the articles to be coated. Withdrawing the smaller vessel immediately, the major portion of the fluid drains back again in a minute or so. To finish draining and to harden the coating, the contents are then shot out on a wire draining surface, and in fifteen minutes are ready to pack. The process is really a cheap and effective form of cold lacquering in bulk. The articles remain bright for long periods of time, while the coating is not in the least obvious.

If the world does not recognize your talents, don't get discouraged; get mad. An angry man sometimes accomplishes something; a discouraged one never does.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited.

A PECULIAR FEATURE OF LARGE STEEL FORGINGS

OCCASIONALLY when machining large forgings a difference in the cutting properties of the metal makes itself apparent at certain points on the surface with more or less regularity, so that as the tool travels along, these spots develop into lines along the work. These lines are caused by the tool either "jumping" over the spot, or "dragging," so as to leave the lines either as slight projections, or depressions.

The cause of these "ghost lines" has been very fully investigated by Professor J. O. Arnold, of Sheffield University, who traces their origin to a definite alloy of iron with sulphide of manganese which segregates during the solidification of the steel when cast into ingot form previous to forging.

This segregation takes place at a series of centres or nuclei, to which are attracted some of the carbon, phosphorus, sulphur, and if present, nickel which are in the steel originally. These segregations form globules which on forging are drawn into lines. On annealing the forging, the carbon in the segregation seems to be expelled leaving the ghost lines in a soft condition.

Test pieces were cut from two propellor shafts, one containing ghost lines, and one without. With the ghost lines running parallel with the length of the specimens, it was found that neither under tensile, torsional, nor alternating stress was any difference observable in the two specimens. Further, no cracking or opening at the ghost lines was detected.

Examining a Large Specimen

On a recent occasion, an opportunity occurred to examine the nature of certain gigantic "ghosts" about 5/8 in. in diameter by 9 in. long, which were found in a chrome-nickel steel ingot intended to weigh about fifty-seven tons. A "burst out" took place five minutes after casting, and seventeen tons of metal were lost before the "bleeding" was stopped. In each of the octagonal angles of the portion remaining in the mould, protruding ghosts of the general dimensions stated were found when the ingot was sawn up cold.

Chemical analysis showed that in the ghosts the carbon present was 0.27 per cent. as compared with 0.19 per cent. in the ghost free portions. Manganese was 0.57 in the ghost, and 0.53 elsewhere. Silicon, sulphur, and phosphorus were much higher in the ghost, amounting to 0.215, 0.12, and 0.082 per cent. respectively as compared with 0.168, 0.037, and 0.028 respectively in other parts. The chromium content was practically the same, 0.74 and 0.75 per cent., but the nickel was largely increased being 4.24 per cent. in the ghost, against 3.74 per cent. in the body of the ingot.

THE BONTEMPI RUST-PROOFING PROCESS

AN addition to the number of rust-proofing processes is announced in an English contemporary. According to the information so far published, the process consists in the oxidizing of cast and wrought iron and steel pieces used in civil, mechanical, electrical, and naval engineering work, thus rendering them able to withstand for a practically unlimited period the corrosive action of the atmosphere, of water, and of sulphurous and other gases.

The pieces to be treated are first cleaned by means of emery paper or by sand blasting. They are then placed on a kind of steel-wire cage; this is driven inside an air-tight muffle which has been previously heated by means of gas jets. When the muffle has been closed in front, after insertion of the pieces to be treated, superheated steam is delivered inside the muffle, with the object of preparing the surfaces of the pieces for the subsequent action of chemical fumes. After the pieces in the muffle have been subjected to the action of the superheated steam for about 30 minutes, the delivery of steam is cut off, and the chemical substance, in the form of a powder, is placed in a separate retort at the back of the muffle. The retort is heated separately, also by gas-jets; the fumes from the chemical powder enter the muffle under pressure, and give the pieces under treatment a protective coating of oxide. On the cage being removed from the muffle, it is covered by a casing, to allow of the gradual cooling of the pieces under treatment.

The pieces so treated, on being removed from the muffle, are of a light grey color, and in that state they are practically non-corrosive in any medium; whilst they are still hot, they are dipped in oil, with a view to render them of a more attractive rich blue-black color. If required, the material so treated can be painted; the paint is more adhesive on treated than on non-treated material. The chemical used is non-poisonous and non-explosive.

The process described has been invented by Augusto Bontempi, an Italian chemist, and is being operated by the British Bontempi Rust-Proofing Company, Ltd., Creek Street, Deptford, London, S.E., which has acquired the British and British Colonial patents.

IMPERIAL MUNITIONS BOARD

Hon. President — Major-Gen. Hon. Sir Sam Hughes, Minister of Militia and Defence.

Chairman—J. W. Flavelle.

Deputy-Chairman — Brig.-Gen. Alexander Bertram.

Members—E. R. Wood, G. H. Dawson, J. A. Vaillancourt, and C. B. Gordon.

Purchasing Agent — W. H. Stewart.

THE INFLUENCE OF MOLYBDENUM ON HIGH SPEED STEEL

THE recent production of molybdenite, the ore which contains the metal molybdenum, has occasioned considerable interest in engineering circles in view of the demand for this metal in the production of high speed steel. The enormous cost of high speed steel has caused a wide-spread interest in the various alloys which impart to it the peculiar edge-retaining properties under the high temperature produced by high speed and heavy cuts.

A series of researches has just been concluded by Professor J. O. Arnold, of Sheffield, and Professor A. A. Read, of Cardiff, dealing with the relations of iron and carbon with nickel, chromium, manganese, vanadium, tungsten, cobalt and molybdenum.

The molybdenum researches involved the making of five varieties of steel, each with a different percentage of molybdenum, but with the other constituents as nearly as possible constant in value. These steels were prepared at Sheffield University, being cast in the form of ingots weighing about 36 lbs. each, and a section two inches square. These were then reheated and hammered into bars 3/4 in. dia. All of the steels behaved well under the forging treatment, in contrast

to reports by previous investigators who noticed "red-shortness"—the superior behaviour of these steels being probably due to greater purity of the molybdenum. After forging, the bars were annealed at 800 deg. Cent., for about eight hours, and then cooled down over a period of twenty-four hours.

PROPERTIES OF MOLYBDENUM STEELS.

Steel.	A	B	C	D	E
Molybdenum	2.43	4.95	10.15	15.46	20.7
Carbon	0.77	....	.....	.....	....
Silicon	0.079	....	.....	.....	....
Manganese	0.23	....	.....	.....	....
Phosphorus	0.017	....	.....	.....	....
Sulphur	0.036	....	.....	.....	....
Aluminum	0.01	....	.....	.....	....
Yield point. Tons sq. in.	25.24	38.28	38.84	41.00	39.64
Max. stress. Tons sq. in.	45.8	49.32	49.16	55.26	53.72
Elongation, per cent.	15.6	11.6	11.6	14.5	13.6
Reduction of area, per cent.	29.1	19.9	23.5	24.9	19.3

Several discs of steel D, ⅝ in. in diameter by ¼ in. thick were prepared. These were heated to various degrees and quenched in cold water. A disc quenched from 1,571 degs. Fah., filed easily and was not brittle. Another quenched from 1,814 deg. could be filed, and was not brittle. A third quenched from 1,940 deg. filed with difficulty and was rather brittle. Discs quenched from 2,057 deg. and 2,156 deg. were both dead hard to the file and very brittle.

Referring to the value of molybdenum to the industries, Professor Arnold did not think the future of molybdenum steel was bright. As an element in steel molybdenum was curiously unreliable. It was more than twice as powerful as tungsten, but tungsten was very reliable in its action. Much money had been lost by steel makers by the reckless use of molybdenum, because of the uncertainty of its action. The general verdict of practical steel makers with regard to its use seemed to be that, while a good molybdenum steel, when obtained, could not be beaten—four or five bad batches of such steel were produced for every good batch.

While corrosion tests on the whole series of steels were still in course of operation, the information was given that with 15 per cent. of chromium present, a steel was obtained which seemed to be practically incorrodible.

CHART FOR CONVEYOR BELT CALCULATIONS

By J. D. Mooney and B. L. Darnell

THE accompanying chart has been drawn for the convenience of engineers as a means of quickly determining the correct number of plies of conveyor belts operating under specific conditions. The calculations are based on the average safe strength with a factor of safety of 15, of the various standard rubber conveyor belts. The calculations assume maximum loading conditions; that is, the belt is considered as carrying the greatest load that it will handle without spillage at ordinary belt speeds. This not only produces the most economical operating conditions, but also the maximum tension in the belt.

The chart is a graphical representation of the formula where:

$p = kgW\ (L+10H)$

p = the correct number of plies

k = a constant depending on the type of drive

g = the weight in pounds per cubic foot of material handled

W = the width of the belt in inches

L = the length of the belt in feet

H = the difference in elevation between the head and tail pulleys, in feet.

For a simple drive, with a bare pulley,

$$k = \frac{1}{250,000}$$

For a simple drive, with a rubber-lagged pulley,

$$k = \frac{1}{300,000}$$

For a tandem drive, with bare pulleys

$$k = \frac{1}{375,000}$$

For a tandem drive, with rubber-lagged pulleys,

$$k = \frac{1}{455,000}$$

The chart is drawn for a simple drive, with a bare pulley, therefore, the number of plies obtained from the chart should be multiplied by the factor 0.83 or 5/6 for simple, lagged drive: the factor 0.67 or 2/3 for tandem, bare; and the factor 0.55 or 11/20, for tandem, lagged.

The formula $p = kgW\ (L+10H)$ has been developed mathematically from the following formulae, which have been found to work very satisfactorily in average good practice:

$$U = \frac{0.08W^2Sg}{5,000}$$

$$HP = \left(\frac{0.021}{200} + \frac{0.011}{10}\right) U$$

$$T = \frac{C \times HP \times 100}{S}$$

$$p = \frac{T}{24W}$$

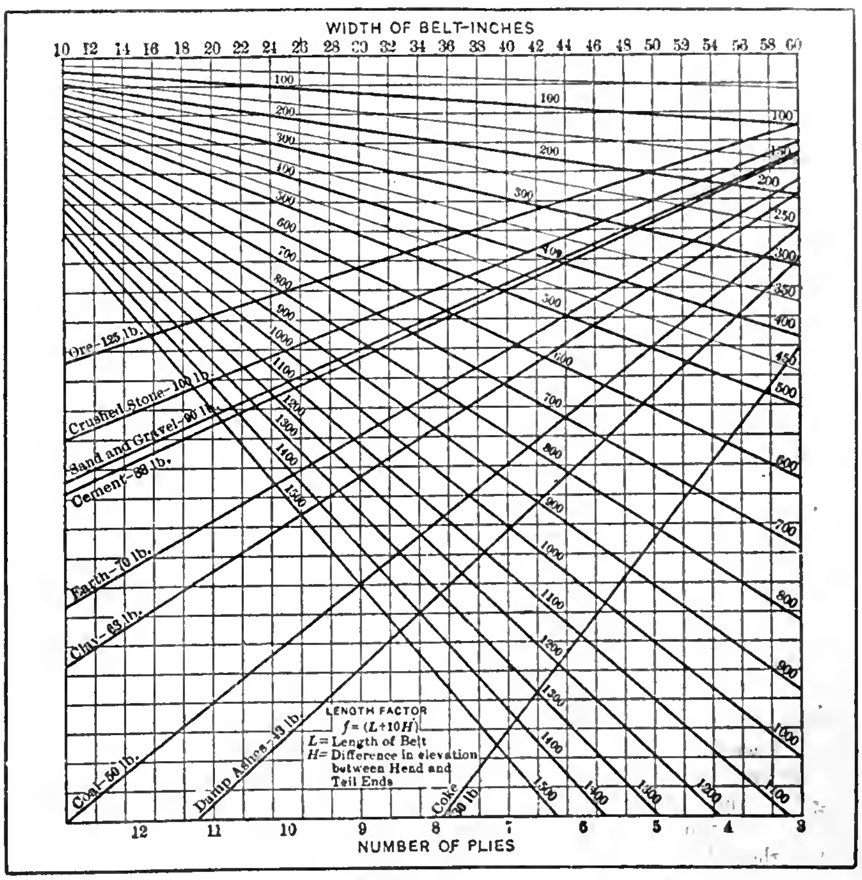


CHART FOR CONVEYOR BELT CALCULATIONS.

Where—
C=Capacity in tons per hour
W = Width of belt in inches
S = Belt speed in feet per minute
g = Weight per cubic foot of material handled
HP = Horsepower developed in driving conveyor belt
l = Length of the conveyor, in feet (approximately ½ L)
H = The difference in elevation between the head and tail pulleys, in feet
T = The total tension in the belt, in pounds.
p = Correct number of plies
C = The constant of the drive.
For a simple drive, bare pulley C = 600
For a simple drive, rubber-lagged pulley C = 500
For a tandem drive, bare pulley C = 400
For a tandem drive, rubber-lagged pulleys C = 330

The length factor, f = (L+10H), represented on the chart by the lines 500, 600, 700, etc., is a developed factor equal to the sum of the length of the belt and ten times the difference in elevation between the head and tail pulleys. To find the correct number of plies for a conveyor belt, knowing the width, the length, the difference in elevation between the head and tail ends, and the kind of material to be handled:

Start from the width given at the top of the chart and move down until this line intersects the line corresponding to the proper length factor; then move either right or left until the line corresponding to the given material is met; then move down again to the scale of plies, where the next largest figure will give the correct number of plies.

For example:—To find the correct number of plies for a conveyor belt 36 inches wide and 300 feet long, with 20 feet difference in elevation; handling sand and gravel: Follow the line from the 36-inch width downward until it intersects the 500 length factor line; then follow to the right until the sand and gravel line is intersected; then down to the ply scale, where the ply will be found to be seven.

ORDER OFFICE PRINCIPLES

EVERY order received from a customer gives your firm an opportunity of making a certain amount of profit. This places your firm under an obligation to each of its customers.

You will fulfil your share of this obligation by guarding your customers' interests. Again, unless you serve your customers well, you serve your firm badly.

Every dissatisfied customer is a wasted opportunity, repeat orders only being obtained by efficient service.

Every contented customer is a stone in the foundation of good-will, on which alone a successful business can be built. By studying your customers' interests, you will best serve your own.

The first order received from any source is the result, direct or indirect, of work done by some other department, and the way in which the transaction is handled by your department will have an important bearing on the obtaining of further business.

You do not come into contact with your firm's customers until an order is placed. See, then, that the service you render is such as to make them willing to repeat the experience.

Whilst you are handling a customer's order, his interests are in your keeping. Show him that they are being properly considered. Thought must be expressed by word and deed.—Herbert's Monthly.

BIG ORDER FOR FREIGHT CARS

THE Canadian Car & Foundry Co. closed an order a few days ago for nearly two thousand freight cars, valued at about $2,000,000, for the French Government. Work on the order is to be started at once. The order ranks as one of the largest equipment contracts yet entered into by a Canadian firm for export.

Last July Canadian Car & Foundry Co. secured a contract for 1,200 freight cars, valued at $1,200,000, from the British Government. The Eastern Car Co., a subsidiary of the Nova Scotia Steel & Coal Co., has also been turning out a large number of cars for the Russian Government, while the National Steel Car Co., of Hamilton, for some time past has been manufacturing small sized cars for France. All this export equipment business represents a new development for Canada.

We understand that the Canadian Car & Foundry Co. recently received its first payment on the big munition contract entered into with the Russian Government last winter. Deliveries under the sub-contracts entered into with American manufacturers are now being made at regular intervals, and will be continued until the various contracts are completed.

It is stated authoritatively that the company's financial position has been considerably strengthened. Gossip regarding an early resumption of dividends is considered premature, however, as the directors are not likely to recommend disbursements to shareholders until the greater portion of the business now on the company's books is completed, and any possibility of future financial difficulties removed. The fact that the company is in a position to take on new business, such as the car contract closed recently, is regarded as a satisfactory sign.

Improvement in ordinary domestic business is said to be having a favorable effect on one of the company's large subsidiaries, the Canadian Steel Foundries. Some large orders for next year were closed recently, and these will supplement the company's activities in the manufacture of war material of various descriptions.

PREVENTING CORROSION IN MARINE BOILERS

A DEMONSTRATION was recently given in London, Eng., of the Cumberland Electrolytic Process for preventing corrosion of all metals immersed in liquids. This system has been developed with special reference to marine boiler application.

According to the inventor, Mr. Elliot Cumberland, the boiler or condenser shell is connected to the negative pole of a 10-volt dynamo; the iron anodes being attached to insulated bolts passing through the shell, and each anode separately joined to the positive pole through an adjustable resistance and a switch. An anode lasted 18 to 24 months, the system requiring very little attention. The current which compensated the corrosive electromotive force also effectually removed hard scale from heating surfaces; the hydrogen bubbles detached the scale, and prevented its further formation. About 2 amperes were requird per 100 sq. ft. of heating surface; the anode, of wrought iron, could be utilized until almost eaten away. The British Admiralty has now adopted the system, and surprising results as to scale removal have been obtained on recent trips across the Atlantic.

Watching the Apprentice—The proprietor of an engineering works in Scotland was watching the leisurely efforts of an apprentice who was swinging his hammer in a gentle way. "Look here laddie," he said, going up to the youth and taking the hammer from him; "when I see a man that takes his hammer by the end of the shaft, and strikes a blow like that, I give that man thirty-two shillings a week; but a man that takes it in the middle like this only gets twenty-five shillings a week, and the sack whenever we get slack. See!" But the boy required an extension of his lesson. "Please, sir," he said, "and where do I hold it for five shillings a week?"

The Goldie & McCulloch Co., of Galt., Ont., will supply the boilers for the new plant being built by the Toronto Carpet Mfg. Co

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

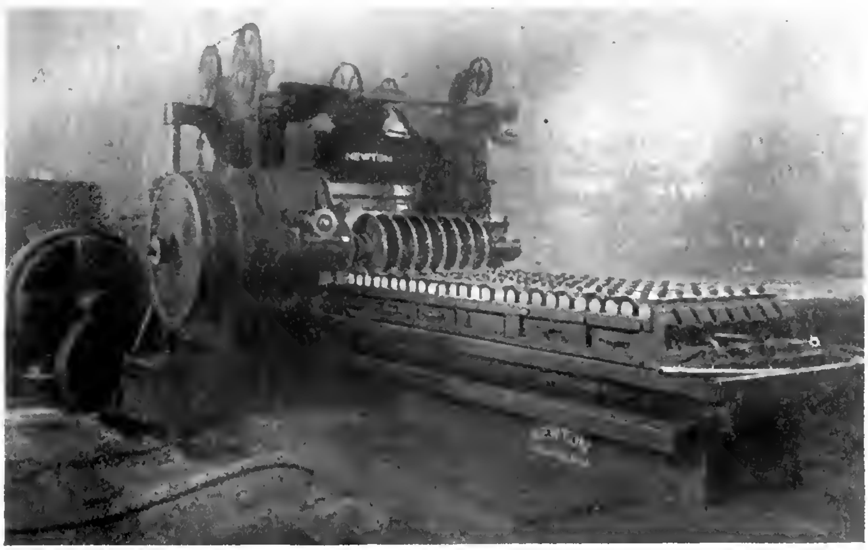
HORIZONTAL MILLING MACHINE

THE 50-in. horizontal milling machine illustrated was originally designed for milling locomotive side and connecting rods, and is now being used for cutting off shrapnel blanks. The method of handling the work is as follows:—Bars, 50 in. in length, are cut off from sixteen bars of steel, which are stacked from three to five high for this operation on the cold saw. The 50 in. lengths are then transferred to the milling machine to be cut up into eight short forging lengths by eight inserted tooth saw blades mounted on an arbor. The rapidity with which this cutting can be done is such that the labor cost is only 25 cents per hundred for the short lengths, which includes the cost of preliminary operation of cutting the steel bars up into 50-in. lengths.

The spindle is arranged to drive a 4-in. arbor by means of a broad-faced key, which is held in place by a through bolt, thus relieving the outboard bearing of all end strain.

The drive to spindle is by a sleeve worm wheel, 35½ in. diameter of steep lead, the teeth being cut in bronze run. The worm is made of hardened steel, and is provided with roller thrust bearings.

Carriage has reversible fast power traverse by means of a friction clutch,



HORIZONTAL MILLING MACHINE FOR SHELL BILLETS.

and the direction in which the lever moves indicates the direction in which the table will travel. Another lever controls the clutch for the feed mechanism, which is provided with an automatic stop. A hand wheel provides hand movement of the table and another wheel governs the adjustment of the spindle saddle and outboard bearing, which can also be raised or lowered by means of an independent three-horse power motor. The saddle is counterweighted, and has square locked gibs bearing on the upright, which can be adjusted by means of taper shoes.

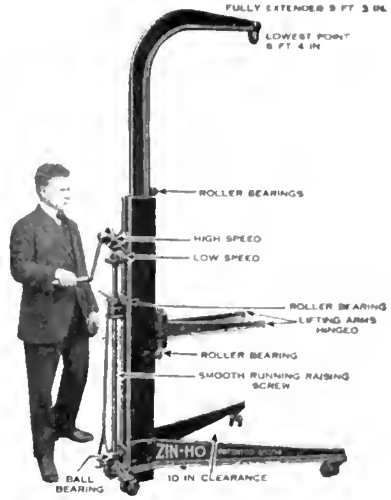
The elevating screws have a top and bottom bearing to maintain alignment at all times. The work table is of heavy construction, and is driven by a spiral rack and pinion. The work table and bed are both connected to the lubricating system and the drip pan is cast integral.

The machine occupies a floor space 21 by 15 feet, weighs 38,000 pounds, and is built by the Newton Machine Tool Works, Inc., Philadelphia, Pa.

PORTABLE JACK AND CRANE

THE adaptability of the screw jack principle to the operation of portable cranes has been made use of in a portable jack and crane recently placed on the market. The device, as will be observed from the illustration consists of a boom or mast similar in appearance to a ship's davit, which can be moved vertically by means of a raising screw located at the back of the vertical guides, thus raising or lowering a nut fastened to the lower end of the boom. The upper end of the raising screw is provided with two sets of hand operated bevel gears which give high and low speeds.

The upper end of the boom is curved over to give a suitable length of reach, and the lower end is provided with a



PORTABLE JACK AND CRANE

couple of arms which swing horizontally out of the way when not required. These arms are very useful in garage work, and are of considerable assistance in assembling many types of machinery where accurate lifting and locating of parts is essential.

This crane is well adapted to handling large shells; its capacity is ample, and the load is self sustained in any position so that one man can adjust the work in his machine with the greatest of ease and accuracy.

Roller bearings support the contact points of the boom on the column, and steering gear of the type usually adopted for this class of device, is employed.

The lowest height of the boom eye is 6 ft. 4 in. from the ground, and the extended height is 9 ft. 3 in. A clearance of 10 in. is provided between the base and the floor.

The total weight of the crane is 300 lbs., and the guaranteed lifting capacity is 4,000 lbs. This device is the product of the Zin-Ho Mfg. Co., 1324 Michigan Avenue, Chicago.

A PEN FOR ENGINEERS

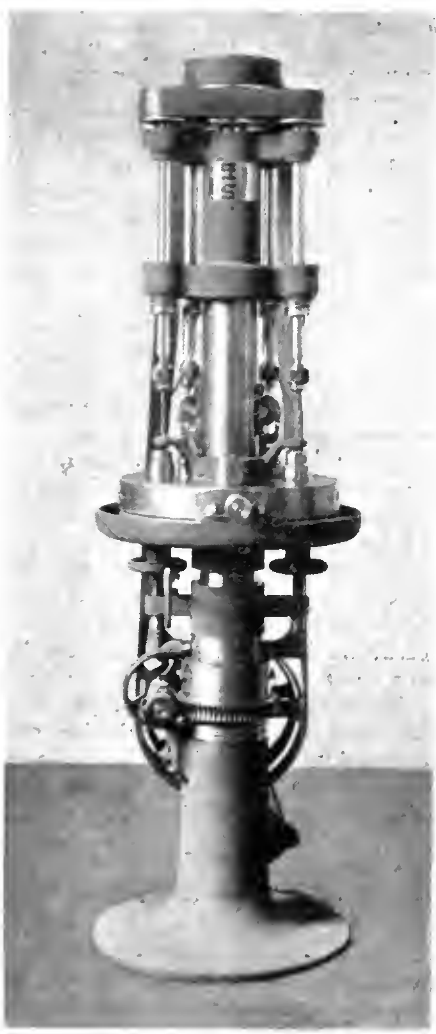
THE desirability of making notes, records, etc., in ink instead of pencil is a practice which is constantly growing amongst mechanics, power engineers and others. The element of permanency is much in its favor but the neces-

sity for ink supply, etc., occasionally is against its adoption. Many skilled tradesmen, however, include a fountain pen in their tool kit, and recent developments in self-filling pens will tend to increase the custom.

A pen which will appeal to users of this class has been placed on the market by the Laughlin Mfg. Co., Detroit, Mich. This instrument is self filling and is conspicuous for the absence of external mechanism.

The barrel is made in two halves which when drawn apart, expose a pressure bar. A slight pressure of the finger on the bar compresses a collapsible ink tube, which when the pressure is released fills itself through the penpoint. When the barrel is closed again the appearance of the pen is that of the familiar middle-joint type.

A feature which appeals to hard users is the safety point inside the non-breakable cap. When the cap is screwed on the point section, an internal shoulder is tightened against a small flange on the end of the point section. By this means, any leakage due to rough handling or other extraordinary treatment is safely confined, and all trouble due to leakage is eliminated.



SEMI-AUTOMATIC, FOUR-SPINDLE DRILL PRESS.

This pen is made in a variety of styles and sizes suited for all classes of work.

SEMI-AUTOMATIC FOUR-SPINDLE DRILL PRESS

A SEMI-AUTOMATIC four-spindle ball-bearing drilling machine for drilling the four clearance holes in threading dies and similar work is being placed on the market by Edgar W. Bemis, Worcester, Mass.

The work table has five chucks so that one chuck is open to the operator for placing and removing work, while the four drills are in operation. This semi-continuous method of operation is the distinctive feature of the machine in connection with its capacity to bore holes in a circle of small diameter with one setting of the work.

In operation the piece to be drilled is placed in the chuck on the front of the table, then the lock pin is drawn and the table is revolved to the first spindle. While the table is rising and the first piece is being drilled, the operator is placing the second piece in the next chuck. The machine has a rated capacity of 1,800 threading dies, 5/16 in. thick, per day. The lock pin, which locks the work table to the lifting table, can be so located by a simple attachment as to allow the chuck center to be moved from the centre of the drill. On the size of machine illustrated, this permits drilling four holes in any circle up to 3½ in. in diameter.

The work table is supported on ball bearings on the lifting table, which moves up and down to feed the drills into the work. The lifting table is sustained by lifting rods, located under opposite sides of the table, which travel on rolls on cams fastened to a worm gear, which revolves around the post, being driven by gears on the main driving shaft. The worm gear and lifting cams rest on ½-in. balls. The contour of the lifting cams governs the depth of work which can be drilled. Small hand wheels on the threaded portion of the lifting rods are employed to adjust the table to the drills. A handle conveniently placed on the side operates a sliding clutch on the worm shaft for stopping and starting the feed.

The chucks are mounted on work spindles which have keyed to them gears meshing with a gear fastened to the hub of the lifting table. As the work table is rotated to bring the piece successively under each drill, these spindle gears index the work to the proper position for drilling. The shank of the chuck is drilled halfway through its length so that the drill can be put up in the shank, then adjusted to the proper position.

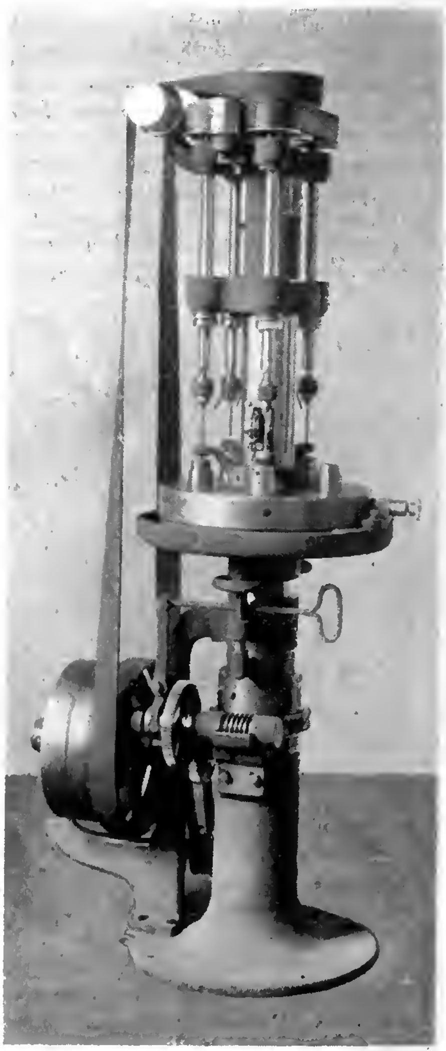
A stud in the top of the post supports a cone pulley, the top section of which receives over idlers a belt from the main driving pulley, the bottom section carrying an endless belt, which travels around the four pulleys on the drill spindles, the belt being kept tight by idlers on opposite sides of the post.

An oil chamber is cored around the head back of the spindle bearings and drip valves are tapped into it from which pipes carry the oil to each drill. A pump driven from the main shaft supplies the oil chamber.

SHELL CUTTING-OFF MACHINE

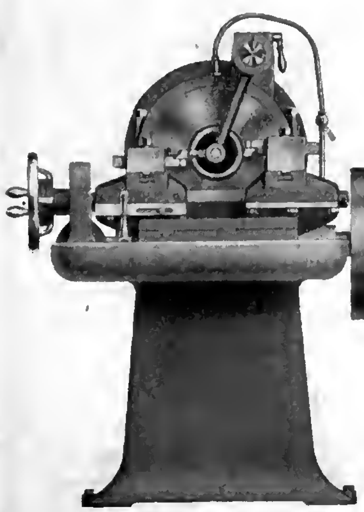
A HIGHLY specialized design of machine for removing the excess length on the open end of shell forgings and facing off the base is illustrated in the accompanying figure. Two sizes, 6 in. and 9 in., are made, the photograph showing the smaller machine.

The headstock is of peculiar design, being of large enough diameter to enclose at either end a powerful universal scroll chuck. These chucks are mounted in each end of the hollow spindle, which is 16 in. dia., and is driven by a 30 to 1



SEMI-AUTOMATIC, FOUR-SPINDLE DRILL PRESS.

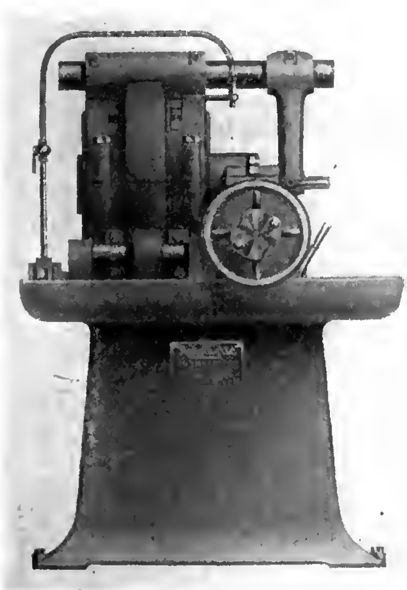
worm gear, located between the bearings. The worm is submerged in oil, and the shaft projects in the rear of the machine, carrying a 20 in. x 6 in. pulley, which runs at 600 revs. per min., when cutting speed is 30 ft. per min.



SHELL CUTTING-OFF MACHINE.

Mounted on the top of the headstock is a sliding bar carrying a gauge arm and stop, adjustable to any required length, and which may be entirely reversed so as to act at the rear end of the spindle if necessary.

A heavy cross slide is arranged across the front of the spindle, carrying front and back tool posts, which are independently adjustable, and moved to and from the work in unison by a substantial power feed mechanism operated with automatic stop-feed device.



SHELL CUTTING-OFF MACHINE.

Both the headstock and cut-off feed mechanism are mounted on a substantial pedestal, having a generous chip and oil pan combined in one casting, the base of the pedestal being used for a lubricating tank, from which a geared pump carries an ample supply of lubricant to the cutting tools.

At a cutting speed of 30 ft. per min. the machine is capable of cutting off the open end of a 6 in. shell in approximately three minutes, with a wall of 1 in. thickness.

The over-all dimensions of the 6 in. machine are 36 in. lengthwise of spindle, 42 in. wide, and 56 in. high, with a weight of 4,500 lbs.

The 9 in. machine requires approximately five minutes per cut, and has over-all dimensions of 60 in. lengthwise of spindle, 58 in. wide and 64 in. high, with a weight of 7,000 lbs.

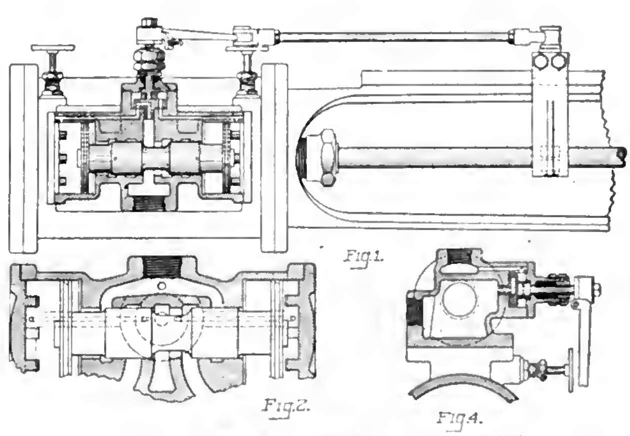
These machines are produced and marketed by the Automatic Machine Co., Bridgeport, Conn.

STEAM PUMP WITH NEW TYPE VALVE

A STEAM pump with a new type of valve gear, which embodies some very unique features, has recently been placed on the market by the American Steam Pump Co., of Battle Creek, Mich.

The pump will be known as the "American-Marsh," this name having been chosen because of the fact that the pump will combine some of the best features of the well-known "American" and "Marsh" pumps which have been manufactured by this firm for many years, and of which they claim to have over 130,000 in successful operation.

As will be noted from the accompanying cut, the pump has a steam valve, which is mechanically actuated, and which is also self-governing. The fact that it is mechanically actuated insures positive action at all times, while the self-governing device allows only just enough steam to enter the pump to do the required work. If the work is light, the admission steam is cut down, while, if the work is heavy, the portage is automatically enlarged. This feature insures an unusually low steam consumption.



STEAM PUMP WITH NEW TYPE VALVE.

The steam valve is of the balanced piston type equipped with expansion rings, while the auxiliary valve is of the semi-rotative disc type, which wears to a perfect seat. There are no slide valves to wear and no noisy links or tappets in the valve gear. In action it is claimed to be perfectly quiet.

It is claimed that this pump cannot hang up even under the most severe conditions, and even if the suction line is broken the pump will not race. The length of the stroke is regulated by two adjusting screws located at the fulcrum of the lever arm.

WAR PROFITS AND THE PATRIOTIC FUND

THAT the patriotism of Canadian Manufacturers does not evaporate with the production of munitions and the pocketing of the profits incidental thereto, is exemplified in the statement recently issued from headquarters of the Canadian Patriotic Fund.

"It has been said that no true patriot will allow himself to be richer at the end of the war than at the beginning. Certainly he should not be so as a result of the war. It was doubtless this feeling that prompted a certain woollen manufacturer, in a town not far from Ottawa, to tell the local branch of the fund that at the end of 1915 he was going to estimate his profits for the year, and should they prove to be greater than his average annual profits for the preceding quinquennial period, the excess profit would be handed over to the fund. He did not wish, he said, that the conclusion of the war should find him better off financially than he was at the outbreak of hostilities.

"The same spirit is beginning to manifest itself in the actions of other people and commercial companies. A noteworthy example is the Dominion Bridge Co., of Montreal. At its annual shareholders' meeting on December 16, the following resolution was passed: 'Resolved that the meeting approve and authorize a contribution to the National Canadian Patriotic Fund for 1916 of two per cent. of the gross amount received on ammunition orders to the end of the calendar year.'

"It is understood that other firms will follow suit, and the same course will doubtless commend itself to many corporations profiting by war contracts."

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - General Manager
H. V. TYRRELL - - - - - Asst. General Manager
PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor.
Associate Editors,
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

B. G. NEWTON - - - - - - Advertising Manager
Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. JANUARY 6, 1916 No. 1

THE NEW YEAR OUTLOOK

WITH the opening of the New Year and the anticipation of another twelve months of war in Europe, it may be said that the activities of metal-working plants generally continue at high pressure. So far as steel mills are concerned, this is especially true, and all indications point to a similar, if not more intensive set of conditions for several months to come. The development of a widespread domestic demand, both here and in the United States, is responsible in large part for the prolonged, into-the-future, abnormal activity.

A feature worth noting is the sustained effort being put forth by Great Britain to become self-contained to the fullest extent possible, not only in the production of war munitions as regards the raw, semi-finished and finished materials entering therein, but also in the matter of the equipment for their manufacture. What is true of munitions is equally true regarding every class of import, and while doubtless those under the wing of her Empire will be given opportunity while opportunity lasts to furnish the work of their craftsmen as well as the flower of their manhood in order to carry the struggle to its only logical conclusion, the time is imminent, yea is here, when we should begin to cast about for war-created opportunities of peace-time trade and commerce.

For the first time in many months, the note has been sounded that the machine tool demand is at least swinging back to normal; it is therefore incumbent on those developing along such a line to proceed discreetly. Shell orders for Great Britain and her Allies are likely to dwindle both in number and extent so far as the United States is concerned in the near future, and while an equivalent of or even more than what has already been placed in Canada may continue on tap for the greater part of this New Year, every day is bringing the lessening and closure of even our opportunity more imminent.

Live interest is already being displayed by engineering firms of every size and type in Great Britain as to what is going to happen when the manufacture of war munitions ceases. How much interest is Canada displaying relative to her position in the like circumstance? We have increased our production capacity enormously, and have given it unstintingly for the prosecution of the war. Should we not, right now, set about preparing to utilize every unit of it with the equally unstinting, equally intelligent, and equally energetic desire towards the accomplishment of peace-time commercial and manufacturing achievement?

We are not of those who expect much Government assistance or co-operation, on the latter's own initiative at least, it is therefore up to our manufacturers—our metal-working plants, to get together in one united body, in addition to planning and charting an individual course of action, and make offer to help or co-operate with the Government toward the desired end, and if the latter be recalcitrant or indolent, then set about "firing" it. It has been very aptly said that "mere grumbling submission is, in a democratic State, an evasion of duty, and deserves to be penalized for the benefit of more active sections who know what they want and how to get it."

Independent action by our large industrial corporations might produce satisfactory results so far as they only are concerned, but to ensure all-round participation and general national prosperity arising out of our new capacity plant activity, the numerical as well as the financial backing of the whole, with or without Government co-operation, becomes absolutely necessary. Under the circumstances and in view of the opportunities available, we should be ashamed to even suggest the scrapping of any part or unit of our now well-equipped plants.

HONORED BY OUR KING

THE New Year Honors distributed by His Majesty the King, have, on the present occasion, not only been comprehensive in scope as far as Canadians are concerned, but they have the added feature of being for the most part demonstrative to an unusual degree of personal worth and achievement relative to their recipients.

The work and worth of such men as Sir Thomas Shaughnessy, president of the C.P.R.; Hon. W. T. White, Dominion Minister of Finance; Collingwood Schreiber, railroad engineer; John Kennedy, harbor engineer, and Brig.-Gen. Alexander Bertram, deputy chairman of the Imperial Munitions Board, have long been recognized and appreciated within and beyond our own borders. The problems to be solved and the tasks to be undertaken as a result of the war have, however, served to accentuate the peace-time usefulness of these gentlemen by reason of the war-time emergency achievement they have so effectively accomplished. All of the recipients of His Majesty's favor are well advanced in years, with the exception of Sir W. T. White, K.C.M.G., notwithstanding, we not only offer to each and all our hearty congratulations on the Honors bestowed, but trust that they may be long spared to go in and out among us in usefulness and in exemplification of good citizenship.

The engineering profession, as will be noted, is particularly prominent in our list, and due to the fact that Brigadier-General Sir Alexander Bertram, K.B., is a son of the machine shop and of the founder of the well-known firm of John Bertram & Sons Co., Dundas, Ont., machine tool builders, the honor bestowed in his case is of special interest to the patrons of this journal. Evidence of the most convincing nature is now breathed broadcast relative to the character of the work of and its achievement realization by the executive head of the late Shell Committee, and while coteries of croakers are always ready to assail and derogate the efforts of the very best of our public-spirited men, and actively have done so, we are right in saying that our "artisan" Knight will continue to receive the full support and appreciation of his craft confreres, and of every right thinking and properly-informed citizen of this broad Dominion.

INDUSTRIAL NOTABILITIES

BRIGADIER-GENERAL SIR ALEXANDER BERTRAM, K.B., Deputy Chairman of the Imperial Munitions Board, and Vice-President of the John Bertram & Sons Co., Dundas, Ont., was born in the latter township on February 18th, 1853, the son of John and Elizabeth (Bennett) Bertram.

He was educated at Dundas High School, on leaving which in 1869, he became apprenticed to his father, in the latter's machine tool manufacturing plant. Growing up with the business, "Aleck Bertram," as the natives of Dundas like to speak of him, ultimately became head of the concern on the retirement of his father and together with his brother, Henry have now made the firm name a household word wherever machine tools are operated in Canada and elsewhere.

Matters military appear to have had a peculiar fascination for the subject of our sketch, for we find him entering the 13th Regiment, Hamilton, Ont., as a bugler some

BRIG.-GEN. SIR ALEXANDER BERTRAM, K.B.

40 years ago. He rose to command the 77th Wentworth Regiment; was transferred to the Reserve of Officers in January, 1905; appointed to command the 3rd Infantry Brigade, West Ontario, 1905; and was made Colonel in 1910.

General Bertram has for many years been an ardent advocate of musketry training, and it is perhaps to some extent due to his influence that our First Overseas Contingent have done such good work on the battle front. He commanded the Canadian Bisley team in 1909, he and it acquitting themselves with marked distinction. He wears the Colonial Auxiliary Forces Officers' decoration, and was gazetted Brigadier-General in 1915. Imperial New Year honors on January 1st, 1916, included the bestowal of the rank of Knight Bachelor on Gen. Bertram, for his untiring and successful administration of the work of the Shell Committee in fostering munitions manufacture in Canada.

In May, 1877, Gen. Bertram married Millechamp, daughter of Hugh T. Smith, Toronto, there being three sons and one daughter of the union. Gen. Bertram is Presbyterian in religion, and in his public and social activities is a member of the Canadian Society of Civil Engineers; the Toronto Club, Toronto; the Military Institute, Toronto; the Rideau Club, Ottawa; and the Engineers and Country Clubs, Montreal.

His residential addresses are Ottawa and Dundas, Ont.

—Portrait, Courtesy of International Press, Toronto.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 20	
Lake Superior, charcoal, Chicago	19 25	
Ferro nickel pig iron (Soo)	25 00	
	Montreal.	**Toronto.**
Middlesboro, No. 3	$24 00	.....
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	24 50	.....
Glengarnock	28 00	.....
Summerlee, No. 1	30 00	.....
Summerlee, No. 3	29 00	.....
Michigan charcoal iron	28 00	.....
Victoria, No. 1	24 00	24 00
Victoria, No. 2X	23 00	24 00
Victoria, No. 2 plain	23 00	24 00
Hamilton, No. 1	23 00	24 00
Hamilton, No. 2	23 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	2.75
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.55
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	...
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	2.75
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	2.30
Structural shapes	2.40
Plates	2.40

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

BOILER PLATES.

	Montreal	Toronto
Plates, ¼ to ½ in., 100 lb.	$2 75	$2 75
Heads, per 700 lb.	3 00	3 00
Tank plates, 3-16 in.	3 00	3 00

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$14 25	$14 00
Copper, crucible	17 50	16 50
Copper, unch-bled, heavy	16 25	16 00
Copper, wire, unch-bled	16 25	15 75
No. 1 machine compos'n	13 00	12 00
No. 1 compos'n turnings	11 25	10 00
No. 1 wrought iron	11 75	11 00
Heavy melting steel	9 75	10 00
No. 1 machin'y cast iron	14 75	14 00
New brass clippings	11 75	11 00
No. 1 brass turnings	9 75	9 00
Aluminum	32 00	29 00
Heavy lead	5 40	5 00
Tea lead	$ 4 40	$ 4 25
Scrap Zinc	13 00	12 00

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect Dec. 14, 1915:

	Buttweld Black	Gal.	Lapweld Black	Gal.
Standard				
¼, ⅜ in.	60	36½	....	....
½ in.	65	45½	....	....
¾ to 1½ in.	70	50½	....	....
2 in	70	50½	66	46½
2½ to 4 in.	70	50½	69	49½
4½, 5, 6 in.	....	....	67	47½
7, 8, 10 in.	....	....	64	42½
X Strong P. E.				
¼, ⅜ in.	53	36½	....	....
½ in.	60	43½	....	....
¾ to 1½ in.	64	47½	....	....
2, 2½, 3 in.	65	48½	....	....
2 in.	....	....	60	43½
2½ to 4 in.	....	....	63	46½
5½, 5, 6 in.	....	....	63	46½
7, 8 in.	....	....	56	37½
XX Strong P. E.				
½ to 2 in.	41	24½	....	....
2½ to 6 in.	....	....	40	23½
7 to 8 in.	....	....	37	18½
Genuine Wrot Iron.				
⅜ in.	54	30½	....	....
½ in.	59	39½	....	....
¾ to 1½ in.	64	44½	....	....
2 in.	64	44½	60	40½
2½, 3 in.	64	44½	63	43½
3½, 4 in.	....	....	63	43½
4½, 5, 6 in.	....	....	60	40½
7, 8 in.	....	....	57	35½

Wrought Nipples.	
4 in. and under	75%
4½ in. and larger	70%
4 in. and under, running thread	55%
Standard Couplings.	
4 in. and under	57½%
4½ in. and larger	37½%

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto.
Lake Copper, carload	$27 00	$23.50
Electrolytic copper	27 00	23 25
Castings, copper	26 00	23 25
Tin	45 00	43 00
Spelter	21 00	19 00
Lead	7 00	7 00
Antimony	42 00	40 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$32 00
Open-hearth billets, Pittsburgh	33 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	40 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 00	$3 05
Cut nails	2 90	2 90
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	3 25	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	65 and 5
Stove bolts	82½
Plate washers	40
Machine bolts, ⅜ and less	60
Machine bolts, 7-16 and over	50
Blank bolts	50
Bolt ends	50
Machine screws, iron, brass	35
Nuts, square, all sizes	3¼c per lb. off
Nuts, hexagon, all sizes	3½c per lb. off
Iron rivets	67½
Boiler rivets, base, ¾-in. and larger	$4.00
Structural rivets, as above	4.00
Wood screws, flathead, bright	85 p.c. off
Wood screws, flathead, brass	62½ p.c. off
Wood screws, flathead, bronze	57½ p.c. off

LIST PRICES OF W. I. PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong, Sizes Ins.	Price per ft.	D. Ex. Strong, Size Ins.	Price per ft.
⅛in	$.05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	....	....
7 in	2.38	7 in	3.81	....	....
8 in	2.50	8 in	4.34	....	....
8 in	2.88	9 in	4.90	....	....
9 in	3.45	10 in	5.48	....	....
10 in.	3.20	....	....	....	....
10 in.	3.50	....	....	....	....
10 in.	4.12	....	....	....	....

COKE AND COAL

Solvay Foundry Coke	$6.50
Connelsville Foundry Coke	5.95
Yough Steam Lump Coal	3.98
Penn. Steam Lump Coal	3.88
Best Slack	3.25

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	25%
At warehouse	15%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS

Solder, half-and-half	0.23½
Putty, 100-lb. drums	2.70
Red dry lead, 100-lb. kegs, per cwt.	9.65
Glue, French medal, per lb.	0.15
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.27½
Benzine, single bbls., per gal.	0.27
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	0.93
Linseed oil, boiled, single bbls.	0.96
Plaster of Paris, per bbl.	2.50
Plumbers' Oakum, per 100 lbs.	4.50
Lead Wool, per lb.	0.11
Pure Manila rope	0.16
Transmission rope, Manila	0.20
Drilling cables, Manila	0.17
Lard oil, per gal.	1.10
Union thread cutting oil	0.60
Imperial quenching oil	0.35

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 40%

PROOF COIL CHAIN.

¼ in.	$9.00
5-16 in.	5.90
⅜ in.	4.95
7-16 in.	4.55
½ in.	4.00
9-16 in.	4.20
⅝ in.	4.10
¾ in.	3.95
⅞ in.	3.80
1 inch	3.70

Above quotations are per 100 lbs.

TWIST DRILLS.

	%
Carbon up to 1½ in.	55
Carbon over 1½ in.	25
High Speed	
Blacksmith	55
Bit Stock	60 and 5
Centre drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 25 per cent; B and C, 35 per cent.; cast iron, 60; standard bushings, 60 per cent.; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 75; malleable, lipped unions, 65.

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 50	$3 50
Canada plates, dull, 52 sheets	3 25	3 60
Canada Plates, all bright	4 60	4 75
Apollo brand, 10¾ oz. galvanized	5 50	6 50
Queen's Head, 28 B.W.G.	6 00	6 00
Fleur-de-Lis, 28 B. W. G.	5 75	5 75
Gorbal's Best, No. 28	6 10	6 10
Viking metal, No. 28	5 25	5 25
Colborne Crown, No. 28	5 70	5 80
Premier No. 28	5 50	6 25
Premier, 10¾ oz.	5 75	6 50

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$17 00	.....
1¼ in.	17 00	.....
1½ in.	17 00	.....
1¾ in.	17 00	.....
2 in.	18 00	10 00
2¼ in.	20 00	11 00
2½ in.	21 00	12 85
3 in.	28 00	13 20
3½ in.	32 00	16 25
4 in.	38 00	20 75

Prices per 100 feet, Montreal and Toronto.

WASTE.

WHITE.	Cents per lb.
XXX Extra	0 13½
Grand	0 12½
X L C R	0 11¾
X Empire	0 10¾
X Press	0 10¾
COLORED.	
Lion	0 08¾
Standard	0 08
Popular	0 07
Keen	0 06
WOOL PACKING.	
Arrow	0 20
Axle	0 14
Anvil	0 10
Anchor	0 08
WASHED WIPERS.	
Select White	0 09
Mixed Colored	0 07
Dark Colored	0 05½

This list subject to trade discount for quantity.

BELTING RUBBER

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble,	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.25
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$12.75
3-16 in.	8.85
¼ in.	6.15
5-16 in.	4.90
⅜ in.	4.05
7-16 in.	3.85
½ in.	3.75
⅝ in.	3.60
¾ in.	3.60

Prices per 100 lbs.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.06
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper sulphate	.10
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	3.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.20
Zinc sulphate	.07

Prices Per Lb. Unless Otherwise Stated.

ANODES

Nickel	.47 to .52
Cobalt	1.75 to 2.00
Copper	.22 to .25
Tin	.45 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.50 to 1.75
Polishing wheels, bullneck.	.80
Emery in kegs	4½ to .06
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.04 to .06
Emery composition	.05 to .07
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., Jan. 3, 1916.—While prevailing conditions are practically unchanged from those of the past few months, it is interesting to note that the present industrial situation throughout the Dominion, at the beginning of a year has never before shown a parallel. Many remarkable achievements and developments have been recorded during the past year, but the indications are that the next twelve months will not only equal those of the past, but in all probability will surpass the most optimistic expectations.

Some of the possibilities for the coming year are the extension of shipbuilding, the establishment of factories for the production of materials for domestic purposes which have hitherto been manufactured in European countries; the possible development of industries for the making of chemicals, dyes, etc., will open up new fields.

The past year has shown that the resources of the Canadian manufacturers and Canadian workmen are practically unlimited, and the co-operation of all parties will place this country well amongst the foremost of the world.

Pig Iron

The demand for steel making pig continues, and with the exception of re-sale iron, little or none can be had by new buyers for the first half of 1916. While there has been no general buying for the third or fourth quarter, some consumers are showing considerable interest in the securing of raw material for their needs during the second half of the year. Added to the enormous demand for pig iron is the acute situation apparent in the supply of foundry coke. Coke producers are having great difficulty in supplying the abnormal demand, and there is some possibility of a good many foundries closing down temporaily until the situation can be relieved.

Locally, the situation remains unchanged and last week's quotations remain firm, although Bessemer, Pittsburgh, shows an advance of $10 a ton.

Steel

After the slight falling off in demand during the holiday season, the market has now resumed its normal condition and existing conditions indicate that the pressure of the past few months will not only continue, but will further increase to such proportions during the first quarter of the year, that present facilities will be inadequate to the demand. The shortage of cars and the congested state of seaboard terminals is gradually developing into a serious situation, material being greatly delayed in its transportation from producer to destination.

The sold-out condition of many dealers foretells a serious shortage of finished iron and steel bars, plates and shapes. Customers are requesting tonnage from their usual source of supply, irrespective of price, this to be arranged at a later date. The shortage of tonnage for marine transportation is creating many inquiries for plates and shipbuilding materials, but the present high cost of material has been and will likely continue to be one of the chief factors in the curtailing or orders for the construction of lake vessels.

Local dealers report an unchanged situation, but in some cases would not be surprised to see many changes within the next few weeks. The revision of price-list will likely take place within the present month and some interesting changes are expected.

The price of billets shows a substantial advance and Pittsburgh quotations are now: Bessemer $32, open-hearth $33 and forging $55 per gross ton.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Machine Tools and Supplies

Activity in the machine tool trade continues, and although the situation is not so acute as a few months back, the tool builders are still busy.

Small tool supplies are still in good demand and the outlook for the remaining winter months is very satisfactory. High-speed steel is still hard to get, with price ranging from $2.50 to $3.25 per pound.

Metals

The chief feature in the metal markets has been the sharp advance in the price of copper, following the heavy inquiries from abroad, and the placing of large foreign orders for 1916 delivery. It is almost impossible to obtain copper under 4 or 5 months, many of the large dealers being entirely sold out. It is the opinion of many in the trade that the present demand, if continued, will advance the price to 30 cents. Tin has been quiet, but future developments in the Far East may have some interesting effects upon the price of this metal.

The other metals show little of interest, but spelter may be weaker in the near future, as manufacturing facilities will then be in a better position to supply the demand.

Copper.—The present condition of the copper market is very strong. Substantial advances have been noted in quotations for the past two weeks, following the closing of a large order for the British Government of 60,000 tons of electrolytic copper to be delivered during the year 1916. The effect of the heavy foreign demand has been the sharp advance quoted in the past and present week's prices. Recent reports of further large munitions orders have had the tendency to add strength to the market.

Every mine, mill and smelter is working at maximum capacity, and all producers are doing their utmost to supply the demand, every facility for increased production being utilized to relieve the situation.

The almost complete loss of copper used in warfare means that consumers can hardly hope to see low figures for this metal for some time to come. The present quotation shows an advance of 4 cents per pound, lake prices being 27c, electrolytic 27c, and castings 26c per pound.

Tin.—Recent reports that certain restrictions are being placed on the shipment of tin to American ports have created considerable excitement on the market, and the situation during the coming weeks depends largely on the stand taken by the British Government in granting shipping permits.

Many inquiries have come to dealers, but consumers are not offering to bid, believing that any excessive buying under present conditions would cause sellers or importers, who have an available supply, to boost the present prices. Firmness prevails throughout the market, present prices being 45c a pound.

Spelter.—Inquiries are good for immediate shipment, but consumers are not anxious to buy, believing that prices will decline before long, as the present prices are not very inviting. The year 1916 promises to be almost as interesting as that just closed, but in the opposite direction. Indications are that before the close of the year prices will be as low as any quoted during 1915.

Present quotations are firm at 21c per pound.

Lead.—The immediate outlook is for

a stronger market. The heavy sales of the past week have advanced prices, and foreign inquiries are heavy. Premiums have been offered for prompt delivery, and orders for shipment are booked well into the first quarter. Foreign advances are noted, but locally the quotation is the same as last week—$700 per 100.

Antimony.—Spot metal is scarce, and dealers report a firm market, with prospect of further advance. Present quotations remain unchanged at 42c per pound.

Old Material.—The general condition of the scrap metals is very good, and an advance of about 5 per cent. has been placed by local dealers upon the prices paid for old metals. However, with the exception of copper, these advances may decline again before the coming week.

Toronto, Ont., Jan. 4.—The holiday season is now over, and as is usual during this period, business has been quiet. The outlook for this year is distinctly encouraging and, unless anything unforeseen happens this year should be a prosperous one. A good start has been made with record crops, large savings deposits in the banks, many factories engaged on war orders and unusual activity in the iron and steel trade; the latter is now generally conceded to be a basic industry. On the other hand some industries not benefiting from war orders are quiet and there is a general tendency towards economizing on account of the conditions prevailing because of the war. The possibility of tight money conditions and the heavy demand on the financial resources of the country on account of the war expenditure will tend toward a policy of retrenchment in national and municipal expenditure.

At the beginning of the year Canada is in an exceptionally strong financial position, due to the improvement in the export trade which has been increasing in volume during the past twelve months and has resulted in a very favorable trade balance. The customs revenue for December is estimated at nearly nine and a half million dollars, being approximately double that of the corresponding month of 1914. The revenues for the last nine fiscal months show an increase of nearly thirteen million dollars over the corresponding period of the previous year. The total volume of trade for the year is the greatest in the history of the Dominion.

Steel Market

The year opens with the steel trade exceedingly prosperous and every indication of continued activity for many months. The large contracts for steel which are being placed in the States by the Allies, a considerable proportion being for third quarter delivery, is an indication of what may be expected in Canada. Even if the demand for steel for shells, to be made in this country were to fall off during the year, there is every probability of large orders for steel being placed with Canadian mills to help to meet requirements in the Old Country. Prices on finished and semi-finished steel are very firm and some products are higher. Seamless boiler tubes have advanced from $3 to $5 per 100 feet, according to size. The discount on cold drawn steel shafting ex warehouse is now 15 per cent., as against 20 per cent. before. Chicago warehouse prices on bars, plates and shapes have advanced 10c per 100 pounds. A sharp advance of 20c in wire nails has been announced; the quotation now being $3.05 per keg, with further advances expected in the near future. Higher prices for boiler plates are looked for any time.

The galvanized sheet market is very unsettled and prices continue to advance.

> **ALLIES PURCHASING AGENTS**
>
> **The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:**
>
> **International Purchasing Commission, India House, Kingsway, London, Eng.**
>
> **French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.**
>
> **Russian.—Messrs. S. Ruperti and Alexsieff, care Military Attache, Russian Embassy, Washington, D.C.**

"Apollo," 10¾ oz., is now quoted at $6.50; "Premier No. 2," $6.25, and "Premier," 10¾ oz., are quoted at $6.50. Prices on English sheets are nominal, as practically none are being imported. Some makers of galvanized sheets in the States are practically out of the market, owing to the unsatisfactory conditions in the trade. Black sheets continue to advance and spelter is high in price, rendering the manufacture of sheets a very speculative and unattractive proposition. The demand in the States for black and blue annealed sheets is heavy, and deliveries are getting backward. Canada plates (dull) are stronger and are now quoted at $3.60. Black sheets, No. 28 gauge, are quoted at $2.60 and blue annealed, No. 10 gauge, at $2.25 Pittsburgh.

The embargo by the railroads in the States on export shipments of iron and steel is still in force, but prices have not been affected, owing to the strength of the market. There is no relief in sight, although the British and French Governments are exerting every effort to supply tonnage to relieve the situation. The heavy demand for steel bars for export continues. Some of the large makers of steel bars have carried over into the new year so heavy a tonnage of undelivered business against 1915 contracts that they cannot take on any further requirements before July. Prices on all steel products are very firm, bars are quoted 2c per pound, Pittsburgh. The billet market is very strong and deliveries are getting more backward than ever, owing to the increase in demand. Prices continue to advance, forging billets being now quoted at $55 Pittsburgh. Bessemer and open-hearth billets are unchanged at $32 and $33, Pittsburgh, respectively. Ferromanganese has advanced $10 and is now being quoted at $110 per ton seaboard. Shipments from England are uncertain and irregular, while, in addition, the heavy demand has created a very unsettled situation.

Pig Iron

The pig iron market is strong with a continued heavy demand for steel-making grades. Canadian consumers are taking large tonnages from American furnaces. Prices are firm and unchanged.

Old Materials

Some excitement has been caused in the market by the embargo which the Dominion Government has placed on the export of wrought and steel scrap to the States. As far as steel scrap is concerned it is reported from the States that serious objection will be raised in that country, as a considerable tonnage of billets is exported to Canada from the States, and American steel-makers claim that the scrap should return to them. The question of withdrawing the embargo is under consideration. The scrap copper market is strong and prices are higher. Wrought iron and heavy smelting steel have also advanced.

Machine Tools

The past week has been a quiet one in machine tool circles. There have been fewer inquiries received recently locally for standard equipment, although there is a fair demand for special tools. The Russian Government is buying a large number of machine tools from builders in the States, but British and French are buying in much smaller volume than was the case a few months ago. The restrictions recently placed by the British Government on the importation of machine tools was designed to eliminate speculators and will not affect responsible makers.

Supplies

Business has been comparatively light during the week, the holiday season having something to do with it. Prices are

holding very firm and some advances have to be noted. A sharp advance has been made in linseed oil, which is now quoted at 93c for raw, and 96c for boiled oil. Cotton waste has advanced again as anticipated in these columns. The new prices range from 1c to 3c higher and are given in the selected market quotations.

Metals

The sharp advance in copper and the unsettled situation in the tin market are the principal items of interest this week. Higher prices for copper have been anticipated for some time on account of the continued strength in the market. The position of this metal is a strong one and the demand continues heavy. Two matters of importance are affecting the tin market; one is the close restrictions which the British Government are placing on exports and the other is the delay occasioned to shipments from the East on account of steamers coming round by the Cape instead of the Suez Canal. The former naturally affects the New York market, but is in no way serious if importers live up to the prescribed regulations. The delay in bringing shipments round by the Cape route is offset by the decreased liability of cargoes being sunk by submarines, this also holds good for antimony shipments.

There is no change in the spelter situation and the market is firm. The lead market is firm and the "Trust" have advanced prices to $5.50 New York. The aluminum market is strong and quotations have advanced.

Copper—The market is excited and higher. The consumption of copper is so great that producers are hardly able to keep up with the demand and there is little or no possibility of any permanent decline in prices while the war lasts. In the local market, copper has advanced 2¼c, and Lake copper is now quoted at 23½c per pound.

Tin—The market is strong but unsettled for reasons already stated, and prices for spot and nearby tin are very firm. There is no serious scarcity of spot tin, so the delay in shipments need not affect the market to any appreciable extent. The New York market is affected by the difficulties being experienced in getting permits to ship tin to America, and the outlook on nearby deliveries is thus rather serious. Quotations are nominal and unchanged at 43c per pound.

Spelter—The market is quiet, both London and New York being unchanged. There is a good demand on prompt and early deliveries, but no interest is being shown in futures. Local quotations are unchanged at 19c per pound.

Lead—The market is strong and the "Trust" have advanced prices $2 per ton, making the current quotation $5.50 New York. There is a good demand for lead and a further rise in the near future is probable. Local quotations are unchanged at 7c per pound.

Antimony—The market is active for futures and strong for spot metal, which is scarce. The heavy war demand continues and the market is holding very firm. Quotations are unchanged at 40c per pound.

Aluminum—The situation is unchanged with a strong market and higher prices. Aluminum has advanced 3c and is now quoted at 68c per pound.

Winnipeg, Man., Jan. 1—There has been a marked improvement in the machinery situation during the past two weeks, although, while the demand for machine tools continues good, there is still considerable difficulty in securing supplies, and much doubt as to whether many more shell contracts will be coming this way. One hears, however, of contracts being received, among which are a company who have taken over the manufacture of a recently patented machine, which it is claimed reduces the time for turning out shells to a minimum. They are said to have taken a contract for shells to show what their machines can do, but have not yet decided whether they will put their product on the market, or sell the rights. The C. N. R., having experienced difficulty in securing machine tools with which to handle their shell contracts here, have started in to make lathes for their own use.

A gold mining company, which is about to start operations on the shores of Lake Winnipeg, will shortly be buying a considerable quantity of machinery and supplies, including engines, boilers, air compressor, blacksmith and machine shop equipment. Altogether, there is a healthier look to business with the opening of the new year. Quite a number of inquiries have been received for machine tools, and December and January, which are usually quiet months in the machinery trade here, bid fair to be the best in a long time. There is a good demand for wood-working tools. The sawmills are getting ready to start again, and are busy with repairs, and overhauling. The demand for transmission supplies of all kinds is very good, but engines and boilers are rather quiet. Business in blacksmith supplies is rather brisk. This comes about through the farmers having plenty of money which they are spending on fixing up their rigs and implements.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

DYESTUFFS SITUATION IMPROVING.

ACCORDING to a statement issued by the Customs Department at Ottawa on Dec. 31, arrangements are under way by which Canadian manufacturers will be assured a supply of dyestuffs in future. Through the co-operation of the Imperial authorities, who have exerted pressure on American manufacturers of such dyestuffs, the Government has been able to relieve the serious situation which promised to develop here. It arose out of the refusal of American manufacturers to export the manufactured dyestuffs to Canada as usual. The scarcity of dyes in Great Britain has rendered export from that country to Canada almost impossible, and Canadian companies had been getting their supplies in the shape of logwood dyes from the United States. When, however, with a view to controlling the product so that the Empire's demand might be met, the British Government placed an embargo on the export of logwood from Jamaica and Honduras, the American companies cancelled their contracts with the Canadian companies, and a famine in dyestuffs threatened. Negotiations were at once commenced by the Canadian authorities looking toward relief. As a result arrangements have already been made to allow the export of 4,700 tons of logwood to the United States companies on condition that these firms shall continue to supply the reasonable demands of the Canadian mills, and further negotiations are under way, which, it is hoped, will result in a workable agreement by which a reasonable supply of goods from the countries named will be allowed to be exported to the United States dye manufacturing companies coupled with conditions which will ensure a supply of the same for Canadian manufacturing purposes.

FINANCIAL SITUATION STRONG

CANADA closes the first calendar year of war in an exceptionally strong financial position. The trade of the Dominion continues to show large expansion in the export column, thus changing the former old adverse trade balance into a favorable balance, which is the special economic importance for purposes of war financing. The measures announced by the Minister of Finance in his last budget for restoring the revenues from Customs and other sources which have suffered during the first few months of war have produced results which exceed even the estimate given to Parliament by the Minister. The statement of Customs revenues for the last month of the calendar year illustrates in a marked degree the working out of the war budget. During the month of December last year the Customs revenue fell to $4,918,798.75. This was during a period of severe trade disorganization when the revenues of Canada were falling at the rate of a million a month. The Customs revenue for the month just closing amounts to $9,432,654.92, an increase of $4,513,856.17, or nearly one hundred per cent. During the nine months of the fiscal year, that is from April 1 to the end of the calendar year, the revenues have increased by no less than $12,891,684.99 as compared with the corresponding period in the previous year. The total revenue for the nine months of this year is $58,829,618.94, as against $71,721,303.93.

SOO CANAL TRAFFIC RETURNS

FREIGHT traffic through the American and Canadian canals in the season just closed aggregated 71,290,304 tons, according to the report compiled by L. C. Sabin, superintendent of the American canals.

Traffic for the year was 15,920,370 tons greater than in 1914, and has been exceeded in volume only in two previous years—1913, with a total of 79,718,344 tons, and 1912, with 72,472,676 tons.

Wheat shipments were 255,481,558 bushels, an increase of 105,197,463 bushels; copper shipments aggregated 156,436 short tons, or 64,672 tons more than last year. Both these commodities established new season's records.

The movement of iron ore was 45,213,604 tons, an increase of 13,799,839 tons compared with 1914. General merchandise, aggregating 1,595,398 tons, represented a gain of 278,094 tons.

The season's lumber movement was 456,451,000 feet, an increase of 4,303,000.

Both anthracite and bituminous coal shipments fell short of 1914. The hard coal movement was 2,030,730 tons, a decrease of 209,775 tons, while soft coal shipments of 11,326,328 tons were 920,388 less than 1914.

Freight traffic through the canals in December aggregated 2,180,420 short tons, against 551,886 tons in 1914.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Toronto, Ont.—Wright & Co. are in the market for an electro-plating dynamo.

St. Thomas, Ont.—The Wabash Railway propose to build a repair shop here.

Hanover, Ont.—David Eidt is in the market for a gasoline engine of from 10 to 20 h.p.

West Lorne, Ont.—The West Lorne Motors, Ltd., will establish a plant to manufacture gasoline tractors, etc.

Arnprior, Ont.—Another mechanical pulp mill will increase the output of Ontario during 1916, it being reported that McLaughlin Bros. of this place are adding a mechanical pulp mill with a capacity of 10 tons daily. Work on the plant will commence shortly. Total cost will be $500,000. It is reported that the Galleta Power Co. is considering the purchase of a large water power at Long Rapids on the Madawaska River, near Arnprior.

Municipal

Lindsay, Ont.—The chemical plant by-law carried by a majority of 32.

Alfred, Ont.—The council contemplate the construction of a waterworks system.

Meaford, Ont.—Extensions to the waterworks system are contemplated at a cost of $4,000.

Tillsonburg, Ont.—A by-law to raise $4,275 for the building of a bridge carried by 274 majority.

Ridgetown, Ont.—The by-law fixing the assessment of D. P. McNorgan on his new mill was carried by 280 to 103.

Galt, Ont.—The by-law to raise $50,000 for a new school passed by a majority of 202.

Listowel, Ont.—The by-law granting $12,000 to a company for the manufacture of shoes carried by a majority of 210.

Woodstock, Ont.—The by-law for providing for $25,000 to build a storm sewer system was carried by a large majority.

Sarnia, Ont.—The by-law to purchase the plant of the Sarnia Gas & Electric Light Co. was carried, 978 voting for it and 503 against it.

Petrolea, Ont.—By-laws to loan a sugar factory $25,000 for general purposes and $21,000 for construction expenses carried by 700 majority.

Parkhill, Ont.—The hydro by-law voted on here was carried by a vote of 221 to 24. The vote approves the entering into negotiations for securing hydro power.

Kincardine, Ont.—The by-law granting a fixed assessment and certain tax exemptions to the People's Salt and Soda Co. carried by a vote of 298 to 46.

Peterborough, Ont.—The by-law to purchase the Exhibition Grounds was defeated, and the Peterborough Metal Products Co.'s exemption from taxation by-law carried.

St. Catharines, Ont.—A by-law to partially exempt the factory of the new company, Chemical Refineries, Ltd., for the manufacture of potash, was carried, by 705 to 147.

Cornwall, Ont.—The electors on Monday voted on a by-law to raise $25,000 for an extension to the water pumping station. The by-law passed with a vote of 295 in favor to 142 against.

Sandwich, Ont.—A by-law to grant the Cardwell Sand & Gravel Co. a fixed assessment, free water and power and light at cost in exchange for the erection of a $50,000 factory, carried by a majority of 176.

Chatham, Ont.—Three industrial by-laws carried by large majorities. These grant fixed assessments to the Gray-Dort Motor Co., American Well Works Co. and the Dominion Sugar Co., and to the last named a bonus of $18,500 toward the purchase of a site.

Sarnia, Ont.—A by-law to spend $120,000 in water main extensions was carried by 40 votes. A by-law to spend $25,000 in the extension of the new waterworks at the lake shore was defeated, 528 voting for it and 942 against it.

Whitby, Ont.—The by-law to ratify an agreement with Chas. Phillips and a syndicate of men who are to establish a $50,000 silk factory here was carried by an overwhelming majority, and the by-law to unite the sewerage system with the waterworks and electric light systems, under the Public Utilities Commission, was carried also.

Electrical

Cobden, Ont.—Voting on the by-law for Hydro-electric resulted in 90 for and 23 against.

Burgessville, Ont.—A Hydro-Electric system will be installed here at an estimated cost of $3,500.

Sarnia, Ont.—The hydro-electric by-law was carried by a majority of 1,062, there being 1,331 votes in favor and 269 against.

Tara, Ont.—The hydro by-law carried almost unanimously, the vote being 111 for, 8 against. The by-law for a new town hall carried by 104 to 17.

Komoka, Ont.—A by-law to authorize the contracting for power from the Ontario Hydro-Electric Commission was carried last Monday by 58 votes to 10.

Forest, Ont.—A by-law to authorize a contract for the taking of electric power contract for the taking of hydro-electric power carried here on Jan. 3 by a majority of 230.

New Incorporations

The George McAllister & Sons, Ltd., Guelph, Ont., has been incorporated with a capital stock of $40,000 by John A. and George McAllister and others to manufacture articles from wood, operate sawmills, etc.

Motor Trucks, Ltd., have been incorporated at Ottawa with a capital of $500,000 to manufacture motor cars and trucks at Brantford, Ont. Incorporators: James Harley, Edmund Sweet and A. M. Harley, all of Brantford, Ont.

The G. H. Tod Co., Toronto, has been incorporated with a capital stock of $40,000 by Charles W. Kerr, 710 Lumsden Building, Toronto; George H. Tod, Bruce E. Ingham and others to manufacture metals, machinery, tools, wire, etc.

The W. G Edwards Co. has been incorporated at Toronto with a capital of $40,000 to manufacture tools, machinery and vehicles of all kinds at Bridgeburg, Ont. Incorporators: William George Edwards and Frank Edwin Jackson, of Bridgeburg.

The Precision Manufacturing Co. has been incorporated at Toronto with a capital of $60,000 to manufacture all kinds of machinery tools, etc., at St. Cathar-

ines, Ont. The provisional directors are John Frampton, Arthur William Varey and M. T. McCarron, all of St. Catharines, Ont.

The Eastern Canadian Copper Corporation has been incorporated at Ottawa with a capital of $990,000 to develop mineral lands and carry on the business of a milling and reduction company. Head office is at Montreal and the incorporators are Edgar T. Sill, A. James Perkins and A. O. Whitworth, all of Montreal, Que.

General Industrial

Rossburn, Man.—The Rossburn Milling Co. will erect a mill here.

Paris, Ont.—The Paris Wincey Mills Co. are building a new factory here.

Scotsguard, Sask.—The Pioneer Elevator Co. elevator was destroyed by fire recently. The loss is estimated at $40,000.

Toronto, Ont.—The factory of the William Radford Hat Mfg. Co. was damaged by a fire on Dec. 30. The damage to the building is placed at about $1,500 and to the contents $5,000.

Tenders

St. Thomas, Ont.—The Hydro-Electric Commission will build a transformer station here. Tenders are to be in by January 15.

St. Hyacinthe, Que.—Tenders will be received up to January 11 for a mechanical filter plant. Plans and specifications may be obtained at the office of Hector Cadieux, city engineer.

Windsor, Ont.—Tenders will be received until January 31 for heating, ventilating and sheet metal work for the new Windsor Collegiate Institute. Particulars may be obtained from the architect, J. C. Pennington, Windsor, Ont.

Winnipeg, Man.—Tenders will be received at the office of the Greater Winnipeg Water District, up to January 10, 1916, for the supply of rock crushing plant. Specifications and form of tender may be obtained at the offices of the district, 901 Boyd Building.

Toronto, Ont.—Tenders will be received by the Chairman, Board of Control, City Hall, Toronto, up to Tuesday, February 1st, 1916, for the supply and delivery of a number of street cars complete, bodies, trucks, motor equipment, air-brake equipment, copper cables for street car work, and fare boxes. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont.—Tenders will be received by the Chairman, Board of Control, City Hall, Toronto, up to Tuesday, January 11, 1915, for the supply and delivery of No. 34, red lead paint for Bloor Street viaduct; No. 74, cast iron special castings for main pumping station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Quebec, Que.—Tenders for a bridge over the Sauvage River will be received at the office of the Quebec Streams Commission, Quebec, until Tuesday, January 11, 1916. These tenders shall be for the following items:—(A)—Tender for a wooden bridge, wooden piers and abutments and bridge approaches. (B)—Tender for concrete piers and abutments and bridge approaches. (C)—Tender for steel superstructure of bridge. (D)—Tender for items B and C combined, viz.: Concrete substructure and steel superstructure. Plans and specifications can be seen in the office of the Chief Engineer of the Quebec Streams Commission, Room 803 McGill Building, Montreal.

EQUIPMENT REQUIRED FOR AUSTRALIAN RAILWAY

Specifications and blue prints of drawings have been received from D. H. Ross, Trade Commissioner, Melbourne, for equipment required by the Victorian Railways. These tender forms are open to the inspection of interested Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer File No. A-1435). Particulars of the requirements, together with the date on which the tenders close at Melbourne are briefly outlined thus:—

No. 29,671. February 23, 1916—2 air pressure blowers and accessories.

No. 29,672. February 23, 1916—1 air pressure blower and accessories.

No. 29,673. March 15, 1916—1 high-speed single spindle sensitive drill with table vise, tools, gears and accessories.

The departure of mails from Vancouver and San Francisco are indicated thus:—

From Vancouver, January 19, due Melbourne on February 12, 1916.

From San Francisco, February 15, due Melbourne on March 7, 1916.

From Vancouver, February 16, due Melbourne on March 10, 1916.

Railways - Bridges

Mimico, Ont.—The hydro radial by-law carried here on Saturday by a large majority.

Toronto, Ont.—The Hydro-Electric radial by-law was carried here by a substantial majority on January 1.

Berlin, Ont.—The hydro radial by-law carried by a majority of 665 at the elections on Monday.

Three Rivers, Que.—The Three Rivers Traction Co. propose making an extension five miles long to their tracks.

Toronto, Ont.—The bridge on Mount Pleasant Road will probably be constructed of steel and concrete at a cost of $33,000.

New Toronto, Ont.—The property-owners voted in favor of the hydro radial scheme, and the by-law carried by a large majority.

Brantford, Ont.—The by-law to sell the Galt-Paris line of the Grand Valley to the Lake Erie & Northern Railway for $30,000 carried with a majority of about 300.

Ottawa, Ont.—The C.N.R. have filed plans for the development of a townsite near Rideau Junction. It is stated that the company will erect its main line repair shops there.

Guelph, Ont.—The Hydro-Electric radial by-law received a substantial majority in every polling sub-division in the city, and was carried by a vote of 932 to 306, or a majority of 626.

Quebec, Que.—The official inspection of the new branch line of 25 miles along the Quebec Central Railway, running from St. Sabine, Bellechasse, to English Lake, in Montmagny County, took place on December 21.

Wood -Working

Mafeking, Ont.—Mutchenbacker Bros. have decided to rebuild their lumber mill at an estimated cost of $20,000.

Collingwood, Ont.—Wilson Brothers will build an addition to their planning mill to cost $35,000. H. A. Currie is president.

Chatham, Ont.—A dry kiln was recently destroyed by fire at the carriage works of William Gray, Sons & Campbell, Ltd.

Buckhorn, Ont.—W. N. Blewitt's saw and planing mill has been entirely destroyed by fire. The loss is estimated at $4,000, which is partially covered by insurance.

Dacre P.O., Ont.—Harry Richards is preparing to rebuild his mill recently destroyed by fire, and is in the market for a planer, lath mill, waterwheel, etc.

Building Notes

The Canada Metal Co., Toronto, have applied for a permit to erect an additional building to their factory on Fraser avenue at a cost of $25,000.

The William Davies Co., Ltd., Toronto, contemplate erecting a new ice house at the St. Lawrence Market at a cost of $15,000, and an application for the necessary permit has been filed with the city architect.

Personal

The Hon. W. T. White, Minister of Finance, has been created a K.C.M.G.

Sir Thomas Shaughnessy, president of the C. P. R., has been raised to the peerage.

John Kennedy, consulting engineer of Montreal, and an authority on harbor works, has been knighted.

Collingwood Schreiber, consulting engineer to the Department of Railways, has been created a K.C.M.G.

Thomas Doherty, president of the Doherty Stove Co., Sarnia, Ont., has been elected mayor of that city.

Clayton E. Hurlbut, president of the Hurlbut Shoe Co., Preston, Ont., has been elected mayor of that town.

A. McKay Edwards, of the Galt Stove & Furnace Co., has been elected mayor of Galt, Ont., for the ensuing year.

F. A. Skelton, director and secretary-treasurer of the Canadian Car & Foundry Co., spent Christmas in Montreal, and has returned to New York.

Captain John Moore, of Windsor, Ont., a well-known lake captain, died recently at Cincinnati, Ohio, while on a visit.

Brig.-General Alex. Bertram, deputy-chairman of the Imperial Munitions Board, has been created a Knight Bachelor.

Lieut.-Colonel W. M. Gartshore, vice-president and general manager of the McClary Mfg. Co., has been elected mayor of London, Ont.

G. W. Caye, assistant to Morley Donaldson, vice-president and general manager of the Grand Trunk Pacific, has been appointed purchasing agent of the Grand Trunk System, with headquarters at Montreal, in place of J. G. Guess, who has resigned.

Hugh S. Wallace, Harbor Commissioner at Hamilton, Ont., has resigned his position in order to take up the management of the Standard Sanitary Co., Toronto.

Frank P. Jones, vice-president and general manager of the Canada Cement Co., Montreal, will probably join the board of the Dominion Steel Corporation.

Lindsay T. Barclay, of the Western Dry Dock and Shipbuilding Co., Port Arthur, Ont., has returned to his home in Port Arthur from Winnipeg after attending the six weeks' officers training course.

Capt. G. C. Coles, who has been lecturer on marine matters and examiner of masters and mates, for the past ten years at Collingwood, Ont., has resumed his winter's work and is holding lectures twice a week as usual.

Annapolis, N.S.—A cable despatch received here on Dec. 28, announced the sudden death at Bristol, Eng., of E. D. Arnaud, Canadian Trade Commissioner. He was formerly manager of the Union Bank branch here.

J. C. Stewart, head of the Canadian Stewart Co., Ltd., has arrived in Toronto from Chicago, to superintend the closing up for the season of the harbor work. Mr. Stewart expressed himself as satisfied with the year's work on the new harbor.

W. J. MacCormack, of the Northern Navigation Co., has accepted a new position with the Algoma Central Railway Co., as head of their fleet of steamers operating from Sault Ste. Marie, Ont., and will take up his new work at the first of the year.

I. E. Suckling, of Toronto, has been appointed general agent for Ontario of the passenger department of the new Canadian Pacific Ocean Service, Ltd. Mr. Suckling has been assistant district passenger agent of the Canadian Pacific Railway's Ocean Lines at Toronto.

Graham Fraser, a pioneer of the steel industry in Canada, died at New Glasgow, N.S., on Dec. 25th. The deceased who was 68 years old, established the Hope Iron Works in 1872, which was the nucleus of what afterwards developed into the Nova Scotia Steel & Coal Co. Mr. Fraser was general manager of the new company for some time when he resigned and was appointed manager of the Dominion Steel Co. He held this position until the Steel Co. amalgamated with the Dominion Coal Co., when he retired from active work.

Trade Gossip

The Renfrew Electric Mfg. Co. will increase the capital stock of the concern to $100,000.

The Canadian Ice Machine Co., Toronto, Ont., have been awarded the contract for a refrigeration plant for the Parisien Hotel, Montreal.

Railway Construction.—In Canada there are 375 miles of line projected, 299 miles under survey and 578 miles under construction, a total of 1,258 miles.

The Owen Sound Iron Works Co., Owen Sound, Ont., have started work on repairing the C.P.R. steamers Keewatin and Assiniboia.

Owen Sound, Ont.—Ratepayers on Jan. 3 voted in favor of a loan of $1,200 to a shoe factory being started here by W. Wilson, of London, Ont.

Kingsville, Ont.—Ratepayers here voted on three by-laws last Monday, carrying them all. A loan to the Brown-Wigle Woolen Mills Co. of $10,000 was endorsed by 131 to 56.

Strathroy, Ont.—By a vote of 304 to 122, ratepayers voted in favor of providing free light and other utilities and fixing the assessment for the Geo. Rivers' basket factory.

The Canadian Car & Foundry Co., of Montreal, has received an order for one hundred 40-ton tank cars from the Imperial Oil Co., and also an order for cars from the Michigan Central Railway.

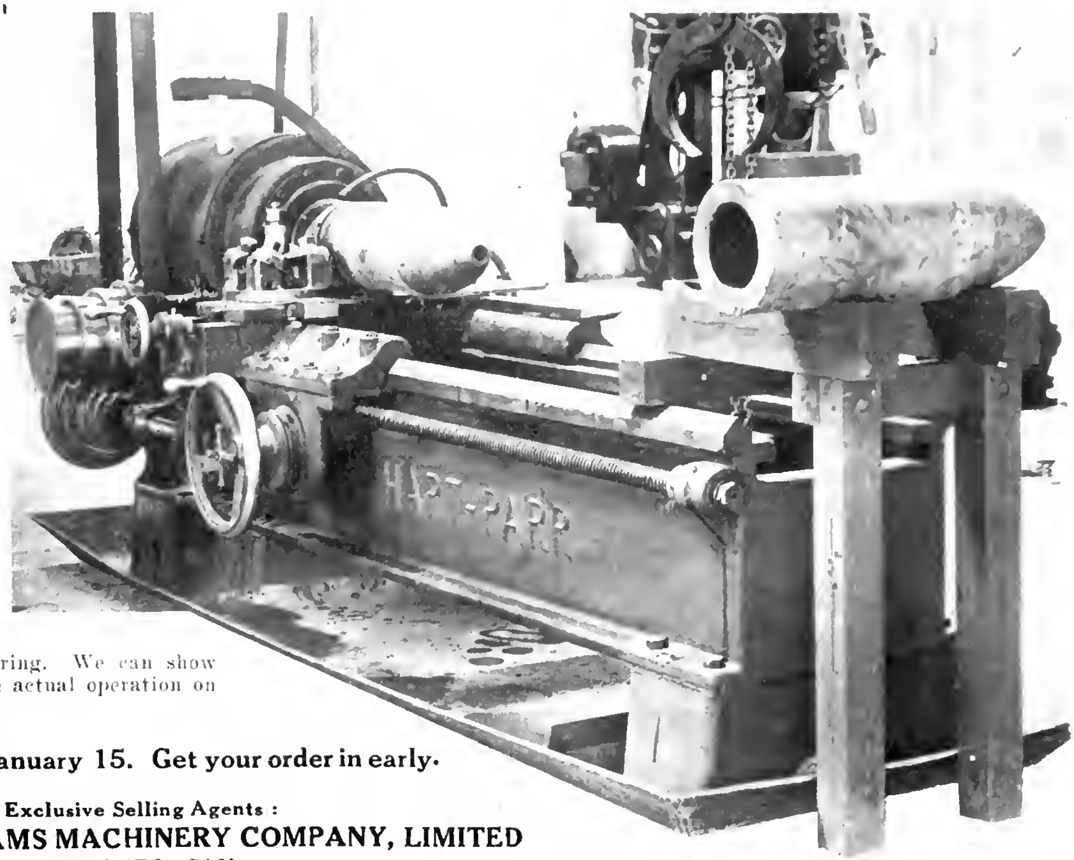
Aurora, Ont.—The Toronto & York Radial Railway Co., have made a reduction of 25 per cent. in the commercial lighting rates, and five per cent. on the street lighting and power account.

The Canadian Car & Foundry Co., Montreal, has closed an order for nearly 2,000 freight cars valued at about $2,000,000, for the French Government. Work on the order is to be started at once.

Yeomans Brothers Co., Chicago, Ill., announce that they have taken charge of the sale and installation of the Shone pneumatic sewage ejectors throughout Canada and the United States. Darling Brothers, Ltd., Montreal, are the Canadian agents for this firm.

Toronto, Ont.—The following municipalities voted in favor of the Hydro-radial project: Port Credit, Trafalgar, Milton, Wilmot, Nassagaweya, Esquesing, Guelph Township, Waterloo, New Hamburg, Stratford, Downey, St. Mary's, London Township, Biddulph. The following voted against the scheme: Waterloo Township, Blanchard, North Easthope, East Zorra.

The HART-PARR SHELL LATHE



This is a special lathe built for producing shells from 6-inch to 12-inch diameter. It requires very little attention, is accurate and possesses enormous stiffness and great durability. Fitted up with tooling complete with profile attachments for turning, and special Cutter Bars and Carriages for boring. We can show you these machines in actual operation on 9.2" British Shells.

Stock deliveries January 15. Get your order in early.

Exclusive Selling Agents:

The A. R. WILLIAMS MACHINERY COMPANY, LIMITED

TORONTO, CAN.

"Here is a Die Head that you can depend upon"

A Geometric Self-Opening and Adjustable Screw-Cutting Die Head

They are being used with absolute satisfaction on every make of Screw Machine.

A micrometer adjustment makes possible quick and accurate variations for a tight or loose-fitting screw. The chasers open automatically, so that no backing off occurs to injure the thread. Length of thread accurately governed—short or long.

Arranged for cutting any diameter, pitch and form of thread. Right or left-hand. Flush to shoulder, where required.

Let us recommend the right sort of Die Head for your work.

The GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U.S.A.

CANADIAN AGENTS: Williams & Wilson, Limited, Montreal.

The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg, St. John, N.B.

The Canadian Locomotive Co., Kingston, Ont., have received an order for 25 locomotives from the Dominion Government for the National Transcontinental Railway. It is reported that 15 of these are "Consolidation" type, and 10 are "Pacific" type engines.

Business Opportunities in Spain.—A recent issue of the Gaceta de Madrid, contains an additional list of goods, the supply of which it is proposed shall be open to foreign competition. Diving apparatus, motor boats, gas meters of more than 30 h.p., electric dynamos and electric motors of 50 h.p., or more; transformers, of all classes, of more than 200 kw.; rails of more than 40 lbs. per yard; tinplates; soft steel, etc.

C. F. Morse Co. Roll of Honor.—Fifty-two of the staff of the Canadian Fairbanks-Morse Co. have joined the overseas forces. Montreal has sent 15; Toronto 7, St. John 8; Winnipeg 10; Calgary 2, and Vancouver 10. Graham Drinkwater, vice-president, states that the company will keep open the positions of those enlisting, and adds: "We believe every Canadian business man should realize that the first business of this country is to help terminate this war, and this can only be done by sending our men, giving our money, and helping the great cause in every possible way open to us."

Workmen's Compensation.—The Ontario Workmen's Compensation Board has issued a list of new regulations numbered 65-86, which became effective on January 1. These include a rearrangement of the iron industries, the separation of the manufacture of explosives from other industries, the bringing together of the building trades in a class, and changes in the railway, canal, road-making and bridge-building industries sections. There is little change in the industries included or excluded. The regulations provide that employers must send in their next annual pay-roll statement by January 20.

Canada's Fire Loss.—The fire wastage in Canada is the worst in the world. The losses in Canada would pay off the National Debt in twenty years. They are seven times as great, per capita, as they are in Great Britain, and we pay five times as much for our insurance as they pay in Europe. The fire loss averages over $2,000,000 per month, or $67,000 per day. Fire commissioners agree that a large proportion of fires are of deliberately incendiary origin, that a still larger percentage are unconsciously incendiary, and that a not inconsiderable number are the result of carelessness or neglect. The number of fires resulting from causes beyond human control constitutes almost a negligible quantity in the year's total.

Catalogues

The Cling-Surface Co., of Buffalo, N.Y., have issued a special calendar of interest to engineers, and as long as the supply lasts will gladly send a copy to any engineer who applies to them for one.

The Electric Furnace Bulletin No. 1030 published by the Snyder Electric Furnace Co., Chicago, Ill., describes fully the "Snyder" electric furnace, its construction and method of operation. The bulletin is fully illustrated and includes views of a number of installations.

The "Cole" Boiler Feeder is illustrated and described in a bulletin recently issued by the Geo. W. Cole Co., Toronto, Ont. A table is included, giving the capacity and price of each size of trap. Other apparatus described and illustrated includes the "Otis" heater, and the "Kitts" pressure reducing valve.

Concrete Mixers made by the Koehring Machine Co., Milwaukee, Wis., are the subject of a bulletin, recently issued. The various types are illustrated and tables give information covering the proportions and quantity of materials that can be mixed in each size of mixer, also weights and capacities of "Koehring" hot mixers.

Vises.—The Rock Island Mfg. Co., Rock Island, Ill., have issued a catalogue "H" describing a complete line of vises for every service. A large number of vises are illustrated and are accompanied by a brief description and tables giving principal dimensions for each size. One of the special lines described as a combination forge, anvil and vise, while other equipment dealt with, includes drop hangers, bearings and safety collars. The catalogue is gotten up in attractive style.

Foundry Equipment. — "Buckeye" Catalogue C, issued by the MacLeod Co., Cincinnati, Ohio, deals with an interesting line of foundry equipment and oxy-acetylene apparatus, etc. The various lines are fully described and illustrated, and the essential particulars are given for the different sizes. Particulars regarding the work for which the different equipment is best suited are also included. The illustrations in a number of cases show the equipment in operation.

The Leavitt Machine Co., Orange, Mass., have issued a pump supplement No. 17 dealing with the improved Dexter pump valve reseating machine. The bulletin describes the machine and its construction while the illustrations show complete outfits for reseating all standard makes of steam pumps. Other illus-

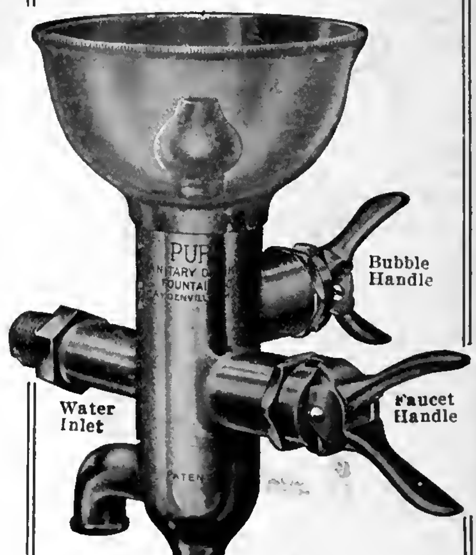
trations show the Dexter method of cutting valve seats with the machine in position. The Smith & Williams patent pump cutter is also illustrated and described.

Friction Clutches.—The "Johnson" friction clutch as applied in machine building is illustrated and described in a catalogue issued by the Carlyle Johnson Machine Co., Manchester, Conn. The catalogue contains a number of testimonials from various well-known firms who have installed these clutches on their machines. On the opposite page to each testimonial is an illustration of the machine referred to, showing location of clutch. The catalogue also serves to show the wide application of the Johnston clutch and its principal features.

The Woods Engineering Co., Alliance, Ohio, have issued a complete catalogue covering their No. 2 Universal Tool and Cutter Grinder. This machine, which is designed to meet the requirements of modern tool room grinding is described fully with the various applications illustrated and dealt with in detail. These illustrations show the setting for various operations, each accompanied by a description. Counter shaft and floor plans are also illustrated while another view shows the machine and all the attachments as listed. Tables of emery wheel speeds and clearance when using cup wheels are included.

Book Review

The "Mechanical World" Electrical Pocket Book for 1916. Published by Emmott & Co., Ltd., Manchester, England, price 25 cents. This book is similar to the "Pocket Diary and Year Book" for mechanical engineers, published by the same company. This issue as in previous years has been considerably improved and enlarged. The contents include a varied collection of electrical engineering notes, rules, tables and data, specially prepared for the use of those in charge of electrical plants or machinery, together with a conveniently arranged diary. New sections have been added, covering switchgear and switchboards, earthing, reductors for half-watt lighting, alkali accumulators, nickel storage cells, efficiencies of direct current dynamos and motors, etc. The section on lighting circuits and switching has been revised, and additional diagrams have been introduced. The sections on electric lamps and electric lighting have been brought up to date, while the book generally has been thoroughly revised. The book contains a great deal of valuable information for electrical engineers. It is fully illustrated and bound in substantial cloth covers.



CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV, TORONTO, JANUARY 13, 1916 No. 2

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President H. T. HUNTER, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY

PETER BAIN, M. E., Editor.

Associate Editors.

A. G. WEBSTER. J. M. WILSON. J. H. RODGERS.

B. G. NEWTON - - - - - Advertising Manager

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—London, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 140 So. Dearborn St., Room 607, Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

High Explosive Shell Manufacture

Staff Article

Each succeeding article appearing in our columns descriptive of shrapnel or high explosive shells has demonstrated the ability of individual firms to successfully and quickly overcome all locational and equipment disabilities. This is noteworthy because in no instance did the peace-time product of our metal-working plants in the least resemble shells.

4.5 SHELL PRODUCTION IN A GENERAL ENGINEERING WORKS

IN the earlier months of shell making the only type of projectile referred to was shrapnel, in various sizes around 3 in. dia., and in quantities which gradually grew from thousands to hundreds of thousands. The course of events, as we are all aware, caused a sudden and urgent demand for explosive shells, at first of similar size to shrapnel, but ultimately stepping up until the present maximum of 9.2 in. has been attained. In some respects the change from shrapnel to explosive shells was welcome; a number of operations were simplified, one or two were dispensed with. The size remained the same, however, and the convenience of this was emphasized in the small amount of experimental work necessary in making the change.

Experience in producing these smaller shells enabled the production of larger sizes to be undertaken with a hitherto unknown degree of certainty, and the majority of firms who took up the production of 4.5 in. and larger sizes based their plans and equipment on the results obtained by manufacturers of the 3 in. or 18-pdr. size. This interchange of experience has been one of the principal factors contributing to the successful production of munitions in this country, not the least interesting phase being its influence on the adaptation and conversion of existing machines.

The plant here described began its shell work on the 4.5 in. size and, due to the circumstances referred to, has made satisfactory progress. The forgings from which the shells are machined are $4\frac{7}{8}$ in. dia. x 14 to 15 in. in length.

After gauging the thickness of the wall, the first operation is facing off the closed end or base. The shell is held in a special sleeve type of chuck shown in Fig. 1, which is also used for the second operation, viz., cutting off open end; in the former case a long internal stop-rod is used, while for the latter a shorter stop is necessary. These operations are being performed on two old discarded lathes which were fitted up with satisfactory results, an output of 250 per day being obtained.

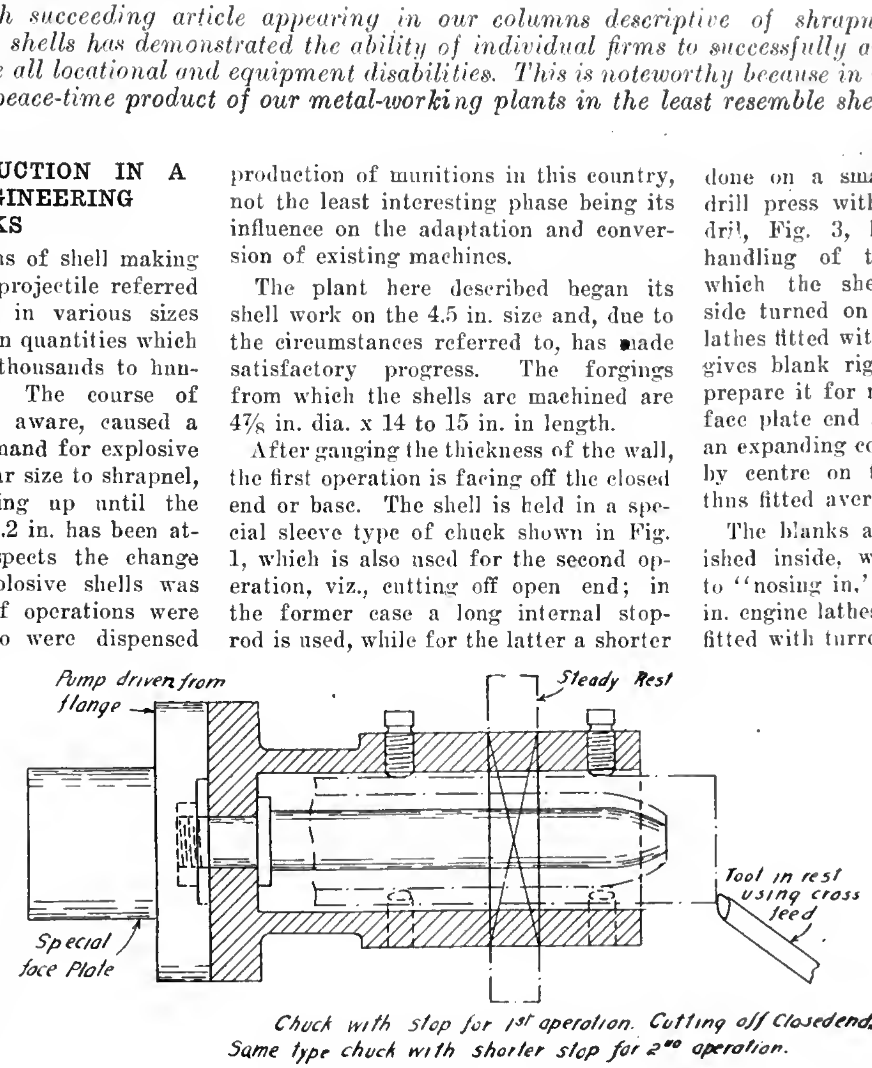


FIG. 1. EQUIPMENT FOR 1ST AND 2ND OPERATIONS

The next operation consists of centering shells true with inside, which is done on a small Wright Machine Co. drill press with special centering mandril, Fig. 3, hinged to facilitate the handling of the rough shells, after which the shell blank is rough outside turned on two "Bertram" engine lathes fitted with a former at back which gives blank right contour necessary to prepare it for nosing. Shell is held at face plate end as per sketch, Fig. 4, by an expanding collet on a taper arbor and by centre on the tailstock. Machines thus fitted average 7 per hour.

The blanks are now ready to be finished inside, which is done previously to "nosing in," on two New Haven 24-in. engine lathes as shown in Fig. 5, and fitted with turret head and tooled as per sketch, Fig. 6. Shell is held in special pot chuck, the outer end of which is carried in a steady rest to eliminate overhang. An output of 3 per hour is obtained from machines thus fitted.

The first tool is a roughing-out double cutter, and is run down the parallel portion of shell; second tool, which is a flat end twist drill, roughs down the base to required thickness and relieves the excessive strain on the next cutter. On the face of the turret head is fitted a small tool to face off the open end to required length. Third tool roughs out the tapered side and bottom, leaving a small cut for fourth tool, which is fed down

FIG. 2. CUTTING OFF OPEN ENDS OF SHELLS ON A PREVIOUSLY DISCARDED LATHE.

the entire length, sides and bottom. The fifth tool is a taper double cutter forming that portion in which the thread is cut after nosing in. It will be noticed that a notch is cut on each side of cutter at a different position; this is to relieve the strain upon the cutter and also break up the chips. On the turret head is a series of stops so set as to give each tool its required travel.

Nosing-in.

The next operation is the "nosing in" or "heading" which is done on a 90-ton hydraulic press, using a cast iron chilled die made by the Jno. McDougall Cal. Iron Works, and fitted with two stops

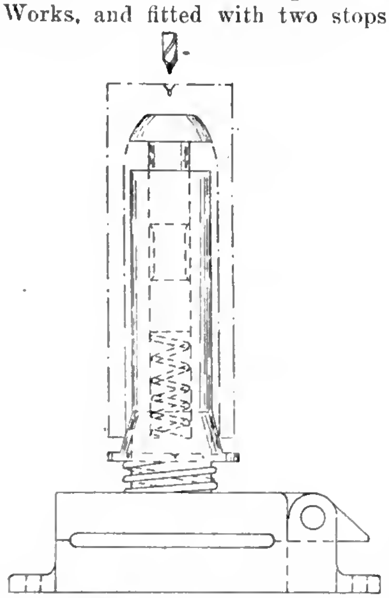


FIG. 3. HINGED MANDREL ON HIGH-SPEED DRILL PRESS TABLE FOR CENTERING SHELLS.

adjusted to the correct travel. These dies have a chill of about ⅝ inch deep, and 6,000-7,000 shells are nosed by each die. Blanks are heated in an oil furnace, constructed in the shop, capable of heating six shells at a time, which, after nosing, are allowed to cool off in powdered mica, so as to avoid any chilling effect, and at the same time relieve any forging strains that may be set up.

Finishing Nose

After nosing, shells are finished internally on the nose end on a "Bertram" engine lathe, also an old Putmans & Sons gap lathe, fitted with turret heads mounted on lathe carriage and tooled as per sketch, Fig. 7. Shell is held in special pot chuck similar to inside boring lathe. The first tool cuts off end of nose to correct length, and the second tool roughs out nose, leaving 1-32 for finish cutter, No. 3. Tool No. 4 taps the thread with a Murchey collapsible tap, while No. 5 machines out the inside of the shell to the correct radius. On this turret head is a series of stops for the cross feed, and on the carriage is another series to regulate the travel of cutters and tap.

The next operation is the "finished outside turning," which is carried out on standard lathes having a former bar at back conforming to the nose shape required. The tool post is carried on a compound slide so that adjustment may be made by means of the screw in case two or more cuts are required. In the nose of shell is screwed a driving centre that fits the driving dog on face plate, the other end being carried in tail-stock centre. Fig. 8 illustrates the arrangement, as described herewith.

After this operation the shell is weighed and enough faced off base end on another lathe to bring it to correct weight. Waving and undercutting is next done on a standard lathe, shown in Fig. 9, specially equipped for same, tooling of which is shown in Fig. 10. The three tools are carried on the four-sided turret tool post on carriage, which is held rigidly on lathe bed. Shell is carried in chuck similar to those previously described. When tool No. 1 is in position, it locates the position of recess on shell by means of a finger stop fitted to the side of tool and hinged so that it is removable when turning shell. Roughing tool is made so that it relieves the waving cutter by recessing between the waved ribs. Waving tool No. 2 is operated by a three-throw cam on outside of chuck. Tool No. 3 does the undercutting in sides of driving-band recess. Chuck for shell is similar to the others except it has a three-throw cam fitted on outside. A production of 11 shells per hour is maintained steadily on this machine.

Recessing Base

The base of shell is reinforced by a forged steel disc or plate which is screwed into it and riveted in place. The base plate recess is done on a Butler engine lathe fitted with a turret head, and tooled as shown in Fig. 11. The base recess is a difficult operation owing to its shallow depth and having to be the proper diameter for threading. Tool No. 1 is made similar to a flat drill to relieve the cutting on centre of roughing cutter No. 2, which leaves 1-32 in.

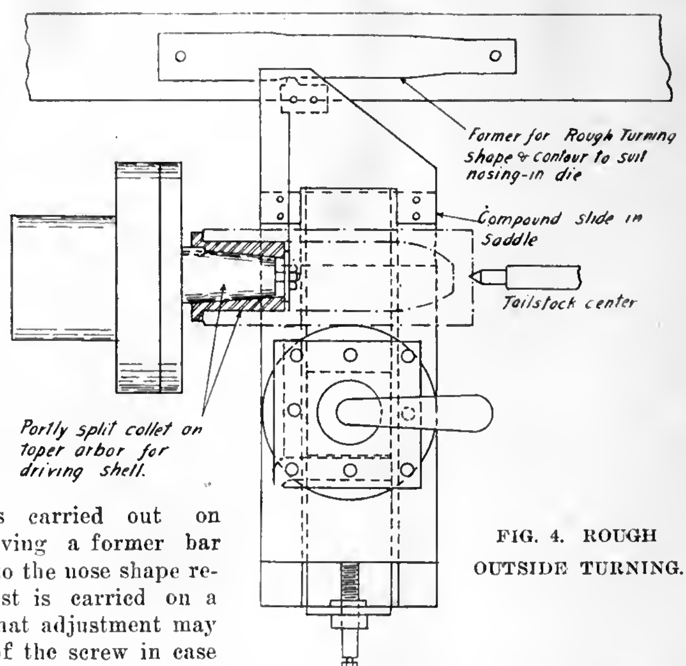


FIG. 4. ROUGH OUTSIDE TURNING.

on diameter, and a scraping on the flat base which is machined off square and made the proper depth by tool No. 3. No. 4 forms a recess at bottom or thread by using the cross-feed in carriage. Tool No.

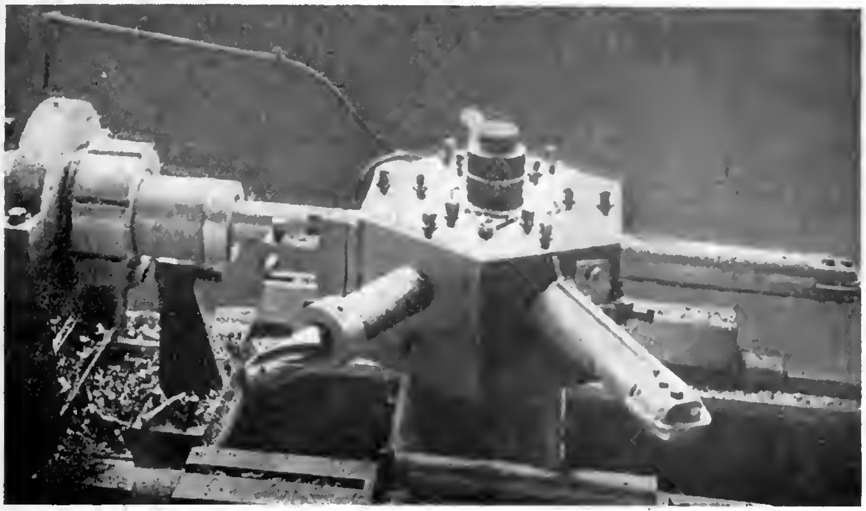


FIG. 5. BORING ON A JOHN McDOUGALL CO. LATHE.

5, finished to size, makes the counterbore the correct depth.

The shell is now ready for the threading, which is done with a Murchey collapsible tap with overhung chasers having the first thread tapered. Shell is held in special pot chuck in steady rest. On the turret head is a series of stops to regulate travel of tools, and one on carriage to locate head on centre line of lathe after using cross-feed.

In the next operation the shell is held in a special type of bench vice and a sizing tap run down the base recess by hand: nose end is also opened up with a sizing tap, after which shell is sandblasted inside to help the varnish to have a better hold, and three chisel grooves cut diagonally across waved ribs.

Preliminary Inspection

Shell is now ready for preliminary inspection, consisting of examination for freedom from cracks, flaws, rust, defective threads or piping, as well as smoothness of surface. The base is also carefully examined for flaws or blow-holes, depth, defective threads and flatness, also that the counter bore is deep enough to allow the extra space for riveting over of base plate. All sizes and measurements are gauged.

Shell is next placed in another special vise and fuse socket is screwed in with threads coated with "Pettman's" cement. Base plate is also screwed home in like manner, after which it is faced off flush with end of shell, after having edges "peaned" over by rolling. Fuse socket is next finished off to the same contour as nose, and with a specially formed internal tool sharp edges are removed. The varnishing of the inside is the next procedure, and is done by pouring varnish from one shell to another with a special protector for the threads. They are placed nose end downwards in holes in a special table with tapered trough to return the surplus varnish into the receptacle for same. After shells have drained sufficiently they are placed upside down in holes in a two-tier truck and placed in an oven where they remain for eight hours subjected to a temperature of 300 degs. F.. The oven, which is a "Mecol" type, is heated by a "Mecol" low pressure oil burner, and can accommodate 160 shells in two tiers on a special truck on tracks extending into oven, and is also equipped with a recording thermometer.

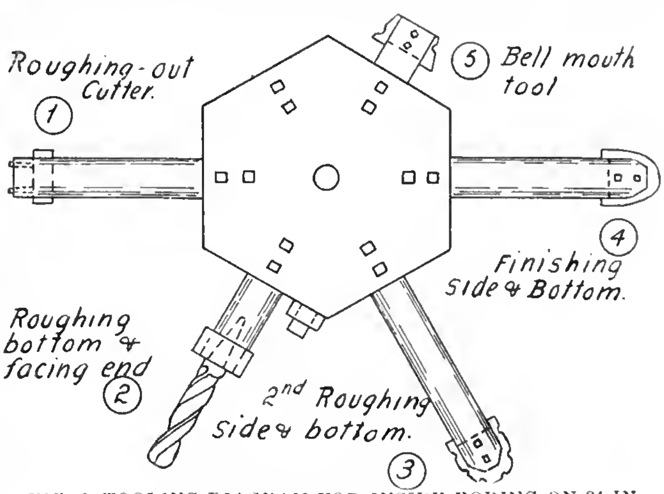


FIG. 6. TOOLING DIAGRAM FOR INSIDE BORING ON 24-IN. ENGINE LATHE.

After varnishing and baking, shells are ready to have copper bands pressed on, which is accomplished by slipping band loosely over the base and into recess, a blow from a mallet being sufficient to hold it in the recess. The band is pressed on in a hydraulic banding press, giving it from three to six strokes to ensure band being pressed in thoroughly into undercut. Shell is moved around each stroke.

The next operation is the turning of the copper bands which is done on a standard engine lathe equipped with a special band turning apparatus, being "Lymburner" product. It is fitted with three tools: 1st, roughing tool which cuts band tapered and underneath shell and moves diagonally with centre line of shell. Tool No. 2 is a rough forming tool which operates on front of band and against a stop on back of cross slide. The finishing tool, which shaves it to size and also forms the grooves and serrations on band, works in a slide carried on a vertical fixture. Limit gauges are used to test the diameter, form, and also concentricity of driving band. Special drive of 5 in. double belt, not satisfactory, was changed to chain drive as shown in Fig. 12, which gave an increase from 80 shells a day to an output of over 200.

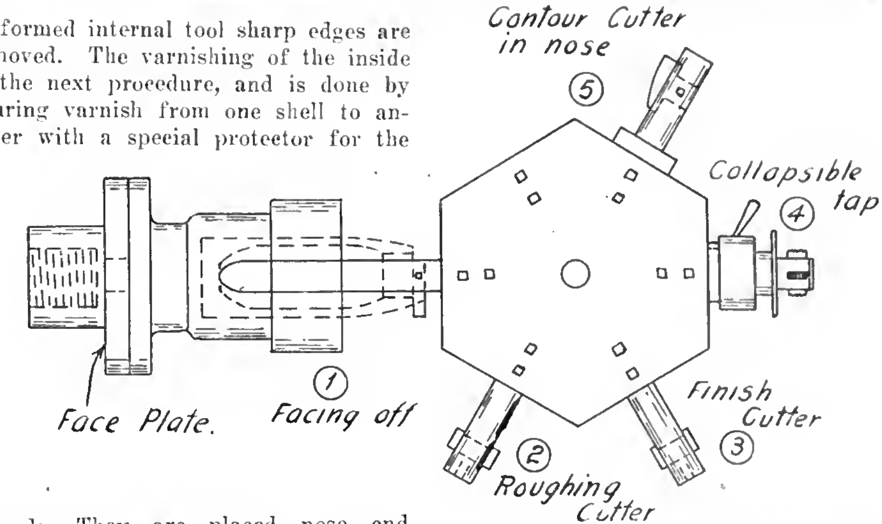


FIG. 7. TOOLING ON "BERTRAM" LATHE FITTED WITH TURRET.

Marking and Painting

Shells have now to be marked on base in a circle, which at the present time is being done by hand, and after being cleaned, they are ready for final inspection, where they are very carefully examined for flaws, blowholes, defects in the varnish, etc., and within the allowances for weight which should be (finished shell unpainted) 27 lbs. 10 oz. plus 2 oz., or minus 4 oz., and when passed final

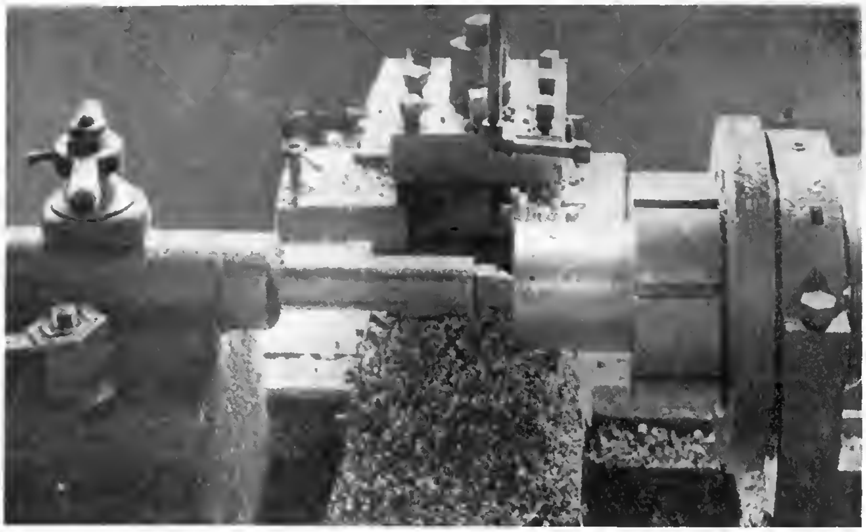


FIG. 9. GROOVING AND WAVING FOR COPPER BAND.

inspection they are coated with two coats of paint, first coat white, and second coat yellow ochre, which is done on a belt driven stationary machine, with the brass cap and fixing screw in the fuse socket: after which they are allowed to dry before being packed two in each box, and are ready for shipment.

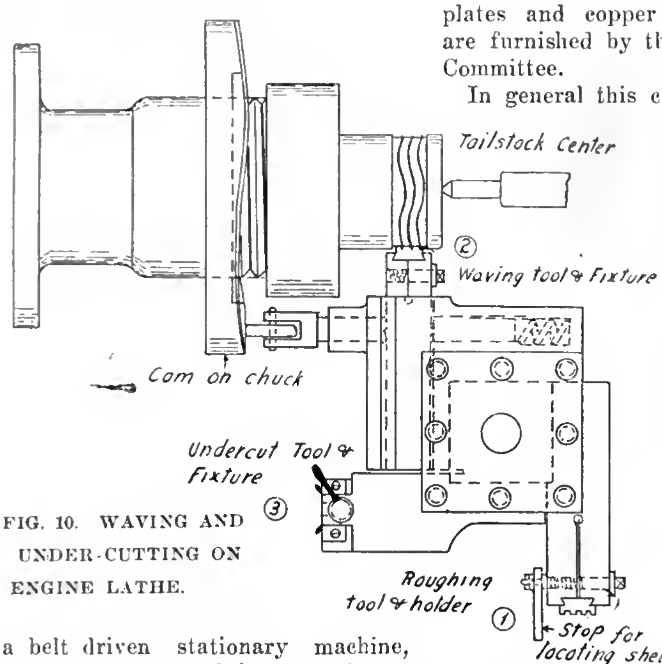


FIG. 10. WAVING AND UNDER-CUTTING ON ENGINE LATHE.

Brass plugs, screws, fuse sockets, base plates and copper bands are furnished by the Shell Committee.

In general this company has not been able to carry on all the operations under one roof owing to location of buildings and lack of space, with the result that there is much greater amount of extra handling than would otherwise be. In the preparation and installation of machinery there was found to be a number of lathes that had passed their usefulness on jobbing work, so they were all pressed into service and were all overhauled, by having all the shears planed, new bearings, new spindles, and in some cases new carriages fitted. The other machines on this work are "Butler," "Bertram," "New Haven," and "McDougall" products. Fixtures and equipment for all lathes with three exceptions were all designed by the Engineering Department, and manufactured in the works.

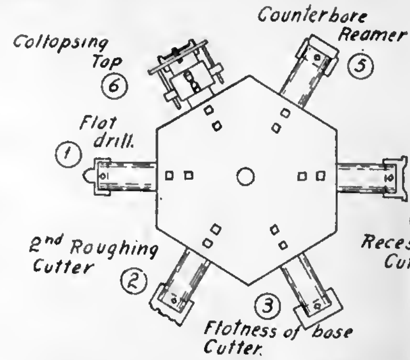


FIG. 11. TOOLING FOR BASE PLATE RECESS.

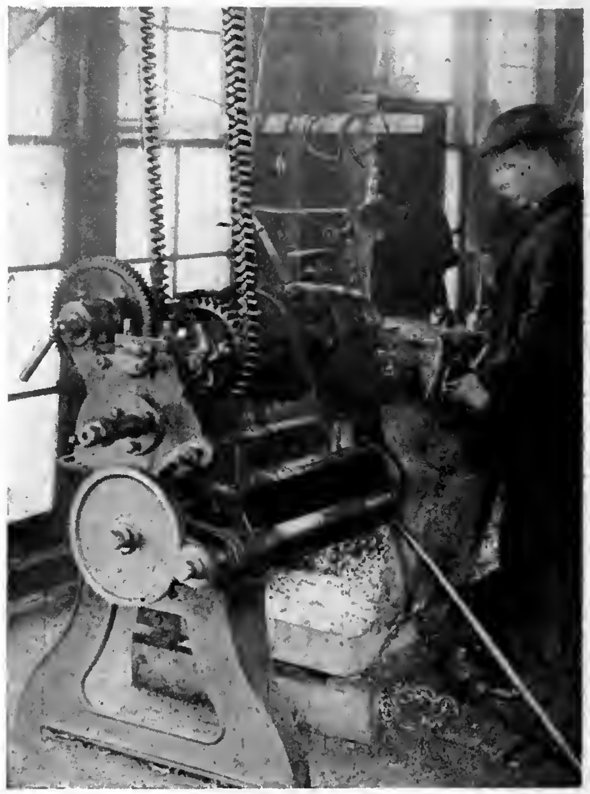


FIG. 12. TURNING COPPER BANDS. NOTE CHAIN DRIVE.

The banding press was all machined and assembled in the works, castings for which were purchased from an outside foundry.

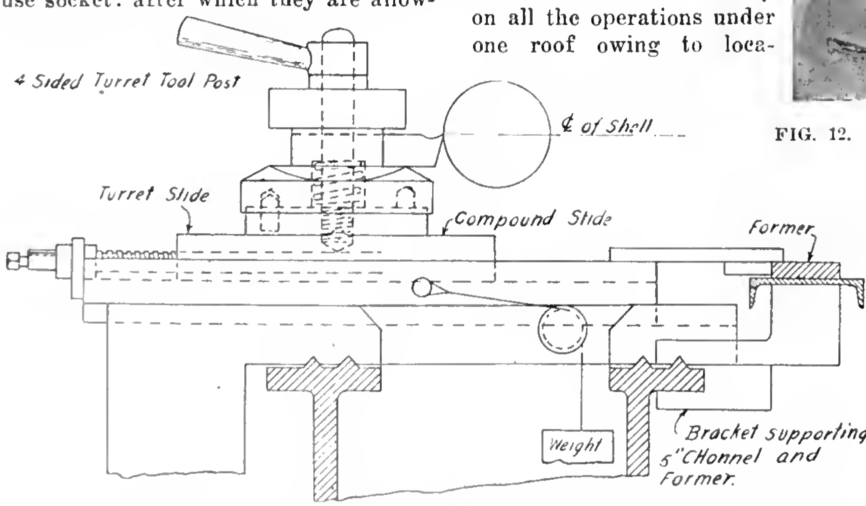


FIG. 8. END ELEVATION OF LATHE, SHOWING FORMER AND TURRET TOOL POST FOR OUTSIDE FINISH TURNING.

Industrial Safety and the Principles of Management--I.*

By W. P. Barba

The leading countries of the Western Hemisphere have been slow in following the examples set by European nations in the matter of workmen's compensation laws. Pennsylvania recently became the twenty-fourth state to adopt a law of this nature, however, and the remarks of the writer indicate the trend of public and private opinion on this subject.

THE matter of accident prevention has come to be considered as a point vital to the success of any business—through the operation of reasons, economic, humanitarian and sociological. Only a few years ago, say ten years, little was heard in this country of more than desultory efforts to minimize the waste of human effort through accidents. Now the slogan Safety First has been given widespread currency, and has lately been improved by coupling with it another, without which the first is really of little value, hence we now hear Safety First—Safety Always.

It requires no detailed presentation to make manifest the waste to the world of productive power through the suspension from their daily labor of men injured therein, of the consumption of materials without the corresponding production which normally would result therefrom—of the real suffering, both of the injured man and those dependent upon him, or of the investment laid aside and idle with every man injured. As part of a study of the principles of management (which should accompany the technical education of every man called to work amongst his fellows) much too little attention is given to the subjects of methods of employing labor, both trained and untrained, and too little weight is laid upon the cost of training any new employee into the duties for which he is hired. Few realize that each man hired into a plant is the subject of investment for quite a time before he is sufficiently trained to the work he is to perform as to return a profit. It is probable that a study of the subject would produce a figure of $150 average of investment in each man before he becomes productive.

Discharging is Non-Corrective

So when true principles of management are but little understood and rarely taught, it is customary to witness many discharges as corrective of offences which are perhaps trivial at best, but which discharges in any case only act as correctives for the benefit of the employer with whom the discharged workman may next engage for employment. A better way, for instance, is to call up the man, convict him to his own satisfaction and yours, of the wrong-doing in question, and then and there apply the punishment which should correct the offence, using means which will inure to the benefit of the employee as well as the employer. This can be effected by lay-off or fine; discharge should be rare, and only for major offences. Fines should be used most often in preference to either of the other more usual means. Fines should be laid with great care for the proper amount needed to effect the corrective, and a relatively small sum usually is sufficient. In no case should fines accrue to the benefit of the company, this having a very disturbing effect upon the value of the corrective, but fines in all cases, both for spoiled work and for discipline, should be converted into a fund for the benefit of the whole body of workers. Some mutual benefit plan, such as is now happily established in most up-to-date works, should receive the results of all fines. The result is then doubly beneficial, and has a balmy effect which removes all soreness and sense of personal injury from the transaction.

Investment Loss Through Injury

Referring again to the loss of investment from removal of trained men from production by discharge, let us also look at this loss through physical injury, and especially those arising from preventable causes. It is, of course, plain that the investment loss through injury can become a permanent loss of producing power, the loss of investment causing the employer to suffer, and the loss of producing power causing the injured man to suffer permanently, as well as through the physical pain he bears, meanwhile; his producing power and income reduced or gone, his expenses continue even on a reduced scale, his mental condition is much disturbed, and he wonders what can be done, and so the rapid but all too slow growth of the safety movement, the liability and compensation laws, the preventive measures, but most powerful of all, and as yet but little developed, the education of every person engaged or even interested in industry, to the end that all preventives be used both without and within the person of the operator subject to injury.

Figures compiled during a term of years point most strongly to the lack of proper education as the prime cause of injury—loss of productive power, and all the attendants of this condition. Hence, industrial safety and sound principles of management are without doubt most closely bound together, and cannot with success be considered apart. Commissioner John Price Jackson, of the Department of Labor and Industry of Pennsylvania, has shown in dollars and cents just what the large number of accidents that are occurring in the industries of the State, are costing the workers. He has not figured what they cost the employers.

During 1914 accidents cost employers in a score or more of the larger industries in Pennsylvania the sum of $1,048,503.96, which total is computed on the daily wage. There were 38,126 men thrown out of work, and each of these men lost on the average $27.50. The accidents from which Commissioner Jackson has computed the figures do not include those reported to the State Department of Mines or the Public Service Commission. The report shows that about one man in every 28 lost time because of accidents, as there were 1,086,508 employees in the industries from which statistics were gathered. The average daily wage was $2.45 and the total number of working days lost was 426,824.

This brief report gives one an idea of the extent to which accident prevention may go, the aggregate for this State only being so large as to appal one, and still does not include mining risks that are notoriously great. Indeed, most of the opposition which was disclosed in an organized way to the enactment of a Workmen's Compensation Act has been from the smaller operators of mines, whose whole capital could be annihilated by the liabilities arising from one accident on a small property.

A New Principle

From the operation of these causes, motives and products alone, there has within the last eight years come into being a general safety movement, looking more toward the possibilities of prevention than ever before. Out of all the upward striving of humanity toward better things and better conditions comes a new principle: namely, that a trade should bear the charges and cost of its casualties, and from this, the employers' liability and workmen's compensation movements have gained much force.

*Presented at the Philadelphia local section of the American Society of Mechanical Engineers, Nov. 23, 1915.

Rarely has there come before the public a movement involving so-called capital and labor, but in reality employer and employed, which has met with such complete support from both sides. But there are no "sides"—the interests of all employed in the world's productive work are entirely identical. To enlarge upon this thought, for it is one of the links attached to the title of this paper, these two, together with their many links, are inseparable—in practical everyday work, just like a graphically expressed formula in organic chemistry.

It will have been noticed from these prefatory remarks that this connection is quite clear. One who is charged by his owners with operating a large manufacturing plant has as his first practical concern the securing and retaining, as well as maintaining in good efficient condition, a well satisfied body of workmen, contented, well paid, and their physical condition well in hand.

After this the managing executive may take up his financing, his raw materials, manufacturing methods, selling organization, etc., but no manufacturer can possibly succeed without this satisfied body of operating workmen—fellow-employees as just outlined—to secure and maintain this condition is a prerequisite to any further success.

The Economic Aspect

The economic as well as the social side of this problem must be just as carefully looked after, now that Pennsylvania has a Workmen's Compensation Act, the twenty-fourth in the United States, which country followed quite a long way behind both Germany and England. No longer will industrial safety be thought a fad, no longer will the courts be filled with cases crying for just relief, no more will the cheap lawyer haunt the hospitals to prey vulture-like upon the unfortunate. Each trade is to bear its share of the cost of its casualties, and the ultimate consumer will pay the bill. All this is exactly as it should be, the only danger lying in the chance, a real danger too, of the whole game being absorbed into some form of political spoils, which God forbid.

Much is being said and printed about foreign trade, foreign competition, foreign methods, and many have objected that the securing of this foreign trade in normal times was difficult, due to the difference in labor conditions, rates of pay, etc. It is very interesting to note that in 1885 Germany established compensation measures, followed by England in 1891, so that our trade abroad is not menaced by the adoption here of these plans for workmen's compensation. On the contrary, we have lagged so far behind these stiff competitors, in these particular matters, as to cause unfavorable criticism of us by those who know.

Now when such compensation acts are generally in force, each employer will be placed automatically on piece work to make his plant safe; and the penalty for failure to achieve safety of equipment will be very great. There are, however, other features in the case: present and proposed laws provide greater compensation for a man with a family than a lone bachelor without dependents, some laws providing compensation for the grandfather of a man injured, when dependent. The natural result will be to select for employment men who offer the lowest risk, both as to compensation penalties and as to physical condition of the applicant, which condition exactly reflects chances of injury, and consequently, the rate of risk. The compulsory insurance laws of Great Britain, placed in operation in 1912, immediately resulted in selection of employees whose rate of risk was the lowest, and thousands of perfectly good workpeople were turned adrift for this reason.

Selection of Insurance Risks

This is one of the consequential results our legislators and agitators should consider most carefully. There will inevitably result a careful selection of the best insurance risks, and defectives of all kinds will find it most difficult to obtain and retain employment. A defective in this sense may be a man physically unfit, incipient hernia, a tendency to joint dislocation, etc. He may be defective in the sense that he just cannot keep out of trouble, and this kind of a man soon cannot keep himself in a job. He will be selected to be always out of a job, until he learns to think enough to keep himself from unnecessary injury. Study of the figures showing frequency of accident to the individual, no matter where working, inevitably searches out such men, and then the employer must move the man, either to another job or else out, both ways meaning a loss of investment, production and earning power. Again education, both of the man and his employer, most necessarily his immediate foreman, is needed and just how best to supply the lack is a task worthy the best mind in your employ.

CUTTING METRIC THREADS WITH ENGLISH LEAD SCREW.

By V. I. M.

DURING the present crisis, we have come across several little stumbling blocks which, though slight in themselves, have rather ruffled the peace of mind of the small manufacturer. One of these, the subject of the present notes, has led to a number of enquiries for lathes with metric screws. These are, however, unnecessary, as a commercially accurate screw can easily be cut to a metric pitch with the addition of one or two "master" gears similar to ordinary change gears, which will cost next to nothing.

A glance at the conversion tables shows us that one inch is equal to 25.3998 millimetres. This may be regarded as 25.4, the error being negligible. Hence by using gears of 10 and 254 on the spindle and lead screw respectively, we should have the required ratio to cut a screw of 1 mm. pitch (assuming the pitch of the lead screw to be 1 inch). The average screw-cutting lathe, however, has a lead screw of two threads per inch, and hence the necessary ratio for 1 mm. pitch will be 10 to 127.

The accuracy obtained is such that the error does not amount to half a "thou." in a length of one metre, when using this "master" gear of 127 teeth. The form of the resulting ratios is also easy to remember (for ½ inch lead screw) as every increase of one in the driving pinion results in an increase of 0.1 mm. in the lead of the screw cut.

For a different number of threads on the lead screw, a different ratio is of course necessary. The following rule sums up the matter in general terms:—

$$\frac{\text{Drivers}}{\text{Driven}} = \frac{5}{127} \times \text{No. of threads on lead screw} \times \text{Pitch to be cut in m/m.}$$

Another approximation for less accurate work can be deduced as follows:— The metre is 39.3708 inches long. This dimension, however, is only about four thousandths of an inch less than 39⅜ inches, so that for all practical purposes we may use the latter number. Since there are 1,000 mm. in the metre, and the metre equals 39⅜ inches, the ratio of gears on spindle and lead screw respectively to cut 1 mm. pitch will be 39⅜ to 1,000, or 315 to 8,000. Hence with a lead screw of two threads to the inch, the gear ratio will be 63 to 800.

Thus for a pitch of 10 mm. the ratio would be

$$\frac{10 \times 63}{800} = \frac{63}{80} = \frac{\text{Drivers}}{\text{Driven}}$$

This may be generalised by the following rule:—

$$\frac{\text{Drivers}}{\text{Driven}} = \frac{63}{800 \times 2} \times \text{No. of threads per in. of lead screw} \times \text{Pitch to be cut in m/m.}$$

It will be found that in some cases the ordinary change gears may be used as the ratio may be found to suit by using a standard gear of either 35 or 105 teeth. This, however, does not generally apply. From this we can see that any reasonable metric lead can be cut by using the master gears of 63 or 127 teeth.—Herbert's Monthly.

CORROSION OF IRON PANS FOR ZINC-MELTING.

OWING to a regrettable conservatism in terminology, engineers will speak of galvanised iron in two different senses—when iron has been coated with zinc, either by being dipped into a bath of molten zinc, or by some galvanic process, as a rule electrolysis of zinc-sulphate. We wish to refer to the former, hot zinc process. The zinc is generally fused in iron pans, and the iron pans are attached by the fused zinc. If that were not so, mechanical galvanising would hardly be efficient; for the zinc is to adhere to the iron, and it does adhere because it alloys to a certain extent with the iron. The iron pans in which the zinc is fused hence suffer, and the practice considers certain kinds of iron especially suitable for making iron pans. Two years ago the well-known establishment of Julius Pintsch, of Furstenwalde, observed to its surprise that an iron pan, supplied by an English firm of repute, which had always given satisfaction, was more quickly corroded by the zinc than lower-grade iron pans. The fact was ascribed to a certain peculiarity in the iron, but a more thorough investigation of the problem was deferred. The results of the subsequent investigation were published last May in the Zeitschrift des Vereines Deutscher Ingenieure. Sheets of ten different kinds of iron were supplied by Krupp in Essen; after having been analysed and examined metallographically, they were cut up into plates, and pairs of these plates were suspended for eight hours in molten zinc at different temperatures. All the plates lost in weight by being kept in contact with the molten zinc, the loss amounting to about 20 grammes of iron per hour, per square metre of iron surface in the well-hot bath; and as long as the temperature was not raised materially, the composition of the iron did not appear to make much difference. An increase in the carbon percentage did not favour the corrosion, nor did a change in the manganese proportion. A rise in the phosphorus percentage from 0.025 to 0.090 did not effect the corrodibility either, though the introduction of phosphorus into the zinc bath is, of course, undesirable. An increase in the silicon percentage did increase the solubility of the iron, noticeably, however, and want of homogeneity in the structure of the iron had the same effect. But these influences were not important, and the temperature of the bath proved of much greater consequence. Zinc melts at 419.4 deg. Cent. As the temperature of the bath was slowly raised from about 437 deg. Cent., at which the first observations were taken, the loss of iron increased slowly at first, but much more rapidly afterwards, when the temperature exceeded 500 deg. Cent. In one case the losses of weight were:— 20 grammes at 437 deg., 23 grammes at 467 deg., 28 grammes at 486 deg., 41 grammes at 495 deg., 68 grammes at 500 deg., and 288 grammes at 532 deg., the loss being understood as before, per hour per square metre of iron surface. This was not the worst case; one iron lost over 500 grammes, another 800 grammes in the eighth hour. At higher temperatures, moreover, the differences between the different sorts of iron became much more pronounced. The chief thing to guard against, then, is an unduly high temperature of the zinc bath. It was further observed that it is advisable to keep the pan, so far as possible, at fairly even temperatures, and to avoid repeated complete cooling and reheating, lest crusts of hard zinc peel off and impair the iron.—Engineering.

EFFECTS OF LEAD UPON GUN METAL

A PAPER read before the Insitute of Metals furnishes some interesting information concerning the effects of lead upon gun bronze tested at different temperatures. It was found that straight gun bronze (88-10-2) dropped from a tensile strength of about 32,500 550° F., above which it rapidly decreased substituting one-half per cent. of lead for an equal amount of copper (giving 87½, 10, 2, ½) it was found that the strength of the bronze remained at about 32,000 lb. up to a temperature of 550° F., above which rapidly decreased to 22,500 lb. at 600° F. The variation in elongation was found to be even more pronounced; at 550° F. the alloy containing one-half per cent. lead gave an elongation of 18 per cent. and the straight gun bronze at the same temperature gave an elongation of a trifle less than two per cent. In gun bronze to which had been added 10 per cent. of lead at the expense of the copper was found a strength of 28,500 lb. and an elongation of 10 per cent., and when the amount of lead was increased to 16 per cent. the alloy still had a strength of 25,000 lb. and elongation of five per cent. This test was made with the metal heated at 500° F. In considering these results it should be borne in mind that lead softens the brasses, and therefore a casting which is to be subject to great erosive action should contain but very little lead.—Engineering.

New Westminster, B.C.—The value of building permits issued by the City of New Westminster, B.C., for the eleven months, up to the end of November, 1915, amounted to $83,795.

CARE OF CRUCIBLES

A hanger issued to brass foundries by the Joseph Dixon Crucible Co., Jersey City, N.J., contains suggestions for the care and treatment of crucibles in foundry operations. On its reverse side is given a table containing specific gravities and melting points of various metals, as well as a number of low fusion alloy mixtures. The suggestions, all of which are valuable, follow:

Refit tongs and shanks to crucibles every 30 days.

Keep fuel in a dry place, as damp or wet fuel causes scalpel crucible.

Don't wedge the metal in the crucible.

There should be about 3 inches of coke space on the sides and 6 or 10 inches of fuel under the crucible, depending upon the size of the latter.

Keep an accurate record of heats.

Store crucibles in a warm, dry place about two weeks, then anneal by heating very slowly and gradually—upside down, preferably—to 250 degrees Fah. or over.

Where oil or forced draft is used, be careful about too much air pressure which produces an oxidizing flames, thereby eating away the plumbago in crucible.

Set the crucible in a bed of dry sand when removing it from the furnace and be sure there are no clinkers left on the bottom or sides of the crucible.

Don't leave the crucible in the fire after the metal is ready to pour.

If possible, recharge the crucible and put it back into the fire before allowing it to cool if an after-heat is to be run.

Don't leave metal in the crucible to cool.

Have shanks fit the crucible, but if clips have to be used be sure that they are sufficiently wide. Better use two sizes of shanks and don't use gates as clips.

Avoid hard, sharp pieces of coke under the crucible.

Be careful with the use of the poker; it is easy to punch a hole through a hot crucible.

Place the crucible in the centre of the furnace so as to give equal fuel distribution all around.

Don't set the crucible in a cold draft or near an open door in the winter.

Avoid fluxes unless absolutely necessary.

Don't drop heavy pieces of metal into the crucible from a distance.

Don't drop large pieces of cold metal into a crucible containing molten metal, without first heating it, or it will chill back.

The top of the crucible should not be set higher than the bottom of the flue hole at the beginning of the heat.

Electric Welding Processes: Developments and Applications--I*

By C. B. Auel **

The development of electric welding to its present state of perfection, has been noteworthy, not only for the economies effected over previous methods of doing the same work, but also for rendering possible the production of many articles and the performance of numerous operations which were formerly quite impracticable as commercial propositions.

THERE are three clearly defined processes of electric welding—arc, incandescent and electro-percussive—of which the last is very recent. The arc processes are autogenous in that welding can be accomplished without pressure, simply by allowing the metals to melt under the influence of the electric current, then to mix and unite as they cool; the incandescent and electro-percussive processes, however, invariably require pressure as a necessary adjunct to their successful accomplishment. The arc processes commercially developed are as follows:

Zerener Process

In the Zerener process the apparatus employed resembles certain types of direct-current flaming arc lamps, the carbons being inclined toward each other and automatically adjusted by a suitable mechanism as they are consumed. By means of an electro-magnet, the arc, which is formed between the ends of the carbons, is directed downward in the shape of a pencil point. The metals to be welded are brought within the influence of the arc where they are then melted or fused as desired. The apparatus is complicated and does not lend itself readily to the carrying of large currents. It is not used in America and only to a limited extent elsewhere.

Benardos Process

In the Benardos process, the arc is drawn between a carbon electrode, which forms one terminal of a direct-current circuit, and the metal to be welded, which forms the other electrode. The welding apparatus itself, aside from the current supply, is exceedingly simple, and there is little to get out of order. As a minimum, 15 kw. at approximately 70 volts should be provided, though rather greater capacity is desirable especially when large work is likely to be undertaken. The voltage across the arc will ordinarily range from 40 to 50 volts, depending upon the class of work.

Slavianoff Process

In the Slavianoff process, the arc is drawn between a metal electrode, which forms one terminal of a direct-current circuit and the metal to be welded, which forms the other electrode. Otherwise, the apparatus is similar to that used in the Benardos process, although the minimum current supply necessary in this latter process may be said to be the maximum supply required in the Slavianoff process. The voltage across the arc is also lower in the Slavianoff than in the Benardos process, ranging from 18 to 30 volts.

Temperature of Arc

The temperature of the carbon arc has been variously estimated to lie between 3500 and 4000 deg. C. All metals may be readily melted by it. In a direct-current carbon arc, the greatest energy consumption and, therefore, the highest temperature occurs at the positive terminal.

When using the Benardos process, and making the metal to be welded the positive electrode, as is the practice, melting of the metal should and does take place at a faster rate than if the carbon electrode were made the positive. In the latter case, it is exceedingly difficult to weld at all below 500 amperes. The reason for this may lie in the fact that the conductivity of an arc depends in great measure upon the kind as well as the quantity of vapor in it. As iron and steel are more readily vaporized than carbon and their vapors better conductors than carbon vapor, there is, for a given current and with the metal forming the positive electrode, a greater quantity of metal vapor in the arc than would be the case were the polarity reversed and, therefore, current flows more readily from the metal to the carbon electrode.

In the Slavianoff process where both electrodes are of metal, the limitation just explained does not exist, and welding may be effectively done with either the work or the electrode as positive, though it is more usual to make the former positive. There might, however, be occasions when it would perhaps be of advantage to reverse these conditions and make the metal electrode positive so that the melting and therefore the deposition of metal would be more rapid owing to the greater heating effect at the electrode.

In both the Benardos and the Slavianoff processes, there are required, in addition to the direct-current supply with its necessary controlling apparatus, electrode holders and electrodes, coverings for the operator and the work, fire clay or carbon blocks, etc., for molding purposes, fluxes and metal filling material.

Direct current, at approximately 70 volts for the Benardos and 50 volts for the Slavianoff process, is necessary. A higher voltage may be used, but is wasteful and is only to be recommended where the amount of welding required is either so small or so infrequent as not to make advisable the installation of a separate outfit; and any excess voltage must first be reduced to the proper amount by the introduction of suitable resistance into the circuit. Satisfactory welds may be made in the Benardos process with 15 kilowatts capacity and even less; it is, however, preferable to have more where large pieces are to be handled or where more than a single operator is to be employed, and similar reasons govern in the Slavianoff process. If current is obtained from an independent source the dynamo should be compound wound with an over-compounding of about five per cent.

Control of the Current

Means for controlling the current supply and the voltage across the arc must be provided, since welds of different kinds will require varying current strengths at varying voltages across the arc. This is attained by the use, generally, of resistance introduced into the main circuit, though sometimes the same result may be secured by weakening the field of the dynamo. This latter method is, however, extremely limited in its application as it can only be used when a single operator is at work; otherwise, other operators on the same circuit would be seriously handicapped. Fig. 1 shows a complete circuit in practically its simplest workable form, and in which barrels of water are employed for resistance.

Metal resistance grids can be substituted with certain advantages for the water barrels, as the latter in time require to be replaced due to the hoops rusting away; furthermore, the resistance of the water changes as it becomes heated, necessitating an occasional readjustment; and, finally, if the outfit is worked very hard the water boils over, involving a stoppage of work in order to allow the water to cool. All other schemes of connections are but varia-

*Abstract of a paper read before the International Engineering Congress, San Francisco, Sept. 20-25, 1915.

**Director of standards, processes and materials, Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.

tions of the above. In theory, such schemes may show to advantage over the simple diagrams of connections described; but, in practice it is reliability and simplicity that are essential above everything else, and a dynamo, when especially designed for welding, should withstand such loads as are thrown upon it. Further, too much stress is laid upon efficiency, whereas it is of secondary importance since current is drawn from the dynamo only at irregular intervals, possibly averaging 15 to 30 minutes out of every hour even when the outfit is in constant service.

Carbon electrodes will range from 1/4 to 1½ in. diameter by 6 in. to 12 ft. long, depending upon the class of welding, whether large or small, and both of these higher limits may be exceeded in certain cases. The carbons should be solid, should neither crack, crumble nor spindle and should preferably be graphitic rather than common, as the former type is of higher electrical as well as thermal conductivity.

Metal electrodes will range from 1/8 to 5/16 in. in diameter by approximately 12 in. long likewise depending upon the class of welding. For welding in wrought iron and steel, nothing can excel the genuine Norway or Swedish iron.

Fluxes and Filling Material

No flux is needed for welding either wrought iron or steel, the field to which arc welding has thus far proved to be particularly adapted. For welding wrought iron or steel, various filling materials may be used, among them being Norway—or Swedish—iron rods, boiler iron, scrap, bits of steel castings, etc.; for cast or malleable iron, Norway—or Swedish—iron rods or special cast-iron rods with a high percentage of silicon.

In the Benardos process, the carbon electrode must be connected to the negative terminal of the circuit, the metal to be welded to the positive terminal either directly, or if more convenient, indirectly by being laid upon a metal table, Fig. 1, to which the positive terminal has previously been connected. In the Slavianoff process, welding may be effected regardless of the connections. The resistance of the circuit should next be adjusted to what is deemed to be the proper amount, after which the circuit-breaker or relays and the line switch are closed. The operator then takes his position with the electrode holder in one hand and the hood (for the Benardos process) or the shield (for the Slavianoff process) in the other. Bringing the electrode as close to the metal to be welded as possible without actually touching it, he then pulls the hood down over his head or raises the shield in front of his face, touches the electrode to the work and instantly pulls it away the required distance, thus striking the arc, which, when a metal electrode is used, will approximate 3/16 in., while when a carbon electrode is employed, will vary from ½ to 2 in. or even more in length, according to the work being done.

In using the carbon electrode, the arc should be given a rotary motion by hand, thus heating the metal to be welded more

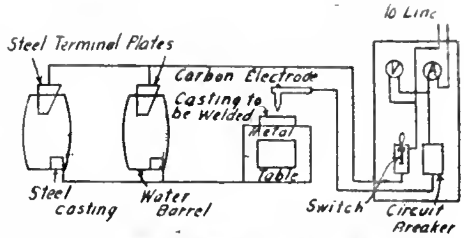


FIG. 1. ARRANGEMENT OF APPARATUS FOR ARC WELDING.

uniformly and preventing burning. It should also be borne in mind that the longer the arc, the less chance there is of carbon entering the metal and producing a hard weld. When the metal reaches a molten condition, filling material is added to it, bit by bit, the arc being interrupted only just long enough to add such material, then being struck and played upon the mass again; or the filling material can be used in the form of a long rod, one end of which is inserted in the molten metal and the arc played upon it until the end is melted off and fused with the mass.

In joining two pieces of any but the thinnest sheet metal together, the abutting edges should first be chamfered at an angle of about 45 degs. either from

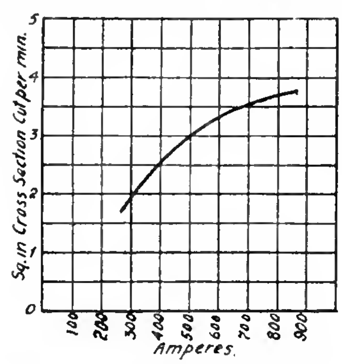


FIG. 2. CURVE SHOWING SPEED OF CUTTING WITH VARYING CONDITIONS.

one or both sides, depending upon the thickness of the material, and the chamfer should extend entirely through.

As soon as the weld has been completed and while still at a white heat, it should be briskly hammered in order to give the metal a finer grain. All oxide and other impurities should, of course, be kept out of the weld. The metal to be welded should accordingly be chipped or machined in the vicinity where the weld is to be made: or the same result may be accomplished by tilting it to a suitable angle, then turning the carbon arc upon it and allowing the slag, in melting, to fall away by gravity.

Heating the metal preparatory to welding is always beneficial as preventing and relieving strains, but is not resorted to except in special cases. Annealing is also desirable at times but like preheating, is not done except when absolutely necessary. A very decided economy can sometimes be effected by repairing a defect discovered during a machining operation, by making the repairs without removing the piece from position.

Metals Which Can Be Welded

Both of the electric arc processes are particularly well adapted to the welding of wrought iron and steel of various kinds; and, while certain other metals including cast iron can also be welded, the work is not, generally speaking, done to any advantage over some of the other processes. Welds in cast iron will prove quite variable when made by the average operator, being frequently glass hard and uncertain as to strength, so that at the present time, it would be rather unwise to make any pronounced claims for arc welding in this connection. With malleable iron, the results obtained are even more variable than with cast iron.

Comparison of Arc Processes

With the Benardos or carbon electrode process, more welding can be performed in a given time than can be accomplished with the Slavianoff or metal electrode process; and viewed from this standpoint alone, the former is the cheaper. As with cast iron, the welds will, however, at times be decidedly hard, so much so as to be occasionally impossible of machining due to carbon from the electrode entering the metal; but when no subsequent machining is necessary, hardness is no disadvantage; and, in some kinds of work, such, for example, as the rebuilding of the ends of rolling mill wabblers, pinions, etc., this very condition is a decided advantage.

In the Slavianoff process, the difficulty of hard welds is largely overcome. The welding of thin sheets can be more readily done and, in fact, a finer grade of work of the lighter kinds performed than with the Benardos process; finally, the ability to reverse connections may be an occasional advantage.

Cutting and Other Applications

In cutting wrought iron or steel with the Benardos or carbon arc the cut will be wider and the edges not comparable in smoothness with any of the oxy-gas cutting processes. However, where electric current is readily available and the finish of the cut is not of especial importance, as in the removal of sink heads and risers from steel castings, it is probably one of the cheapest methods for such work, since almost no time need be spent in setting up the casting in position, as is necessary when cutting by

machine or hand. Fig. 2 shows the rate of cutting steel with the electric arc.

The electric arc processes of welding were originally largely confined to repair work in wrought iron and steel, but since becoming better understood, their uses are extending: for example, surplus metal including fins, risers, sink-heads and nails are easily removed from steel castings, holes are bored in wrought iron or steel plates, wrought iron or steel pipe sections are readily joined together or flanged, the ends of wrought iron rings are welded, wire nails may be pinned to wrought iron or steel plates, tap holes or tuyeres in furnaces are opened, broken drills and taps are easily removed from castings, etc.

The following figures have been obtained in the works of the Westinghouse Electric & Mfg. Company, as regards the cost of welding rings by the blacksmith and by the carbon arc respectively.

Sections.	Smith Welds*	Arc Welds*
1 x 1½ in.	$0.59	$0.51
1¼ x 1½ in.	0.66	0.30
1½ x 2 in.	1.13	0.45
1¾ x 2½ in.	1.25	0.45
2 x 6 in.	3.05	0.85

*Labor costs only included in above.

For filling a drilled hole. 1¼ in. diameter by 2 in. deep in a cast steel axle cap, a 1½ x 6 in. carbon electrode was used. The current ranged from 500 to 650 amp., and the time required was 56 seconds.

The following table shows the current used and time required for welding sheet steel seams:

WELDING SHEET STEEL SEAMS.

Gage B.W.G. or In.	Metal Electrode. Diameter B.W.G. or In.	Current Amperes	Rate of Welding. ft. per hr.
28 to 20	18	10 to 25	30
18 to ⅛	1/16	20 to 40	25
⅛ to 3/16	3/32	30 to 60	20
3/16 to ¼	⅛	50 to 100	15
¼ to ⅜	5/32	75 to 150	10
Over ⅜	5/32	150 to 180	Variable

To burn a hole 1¾ in. diameter by 1½ in. deep in a wrought iron plate, using a 1½ x 6-in. carbon electrode, utilized a current of from 370 to 1,000 amp., and required 3 min., 30 sec., including 45 sec. for reversing plate. A sink head of 13½ sq. in. cross-sectional area was removed from a cast steel axle cap in 4 min., 45 sec., including time for set up, with a current of 600 to 850 amp., and using a 1½-in. by 6-in. carbon electrode.

The table below shows the time required for cutting steel with the electric arc, using a graphite rod 1 in. diameter as the negative electrode:

Strengths of Welds

Often the strength of the weld is of small consequence as it is simply a matter of filling up blow holes or equivalent imperfections, and even where strength of weld is involved, the metal to be welded usually has a large factor of safety, so that even though the welded portion may not be equal in strength to the original material, it still will have a considerable margin of safety. Furthermore, the material at the weld can often be reinforced so that a strength equal to the original can thus be obtained.

With the carbon electrode process, the current will range from possibly 100 to 600 amp. or more, depending upon conditions; in cutting, the figures will usually run slightly higher. With the metal electrode process, the current for welding will range from 10 to 200 amp.

There seems to be indicated certain best limits for current and size of electrode, and in the carbon arc process, too rapid work is harmful. Either process will give about the same strength of welds, but in machine steel the ultimate strength will average approximately 80 per cent. of the original, while in cast steel the strength of the welds will run 10 to 12 per cent. lower.

CUTTING STEEL WITH THE ELECTRIC ARC.

Size of Section Cut, In.	Area Cut, Sq. In.	Cutting Current, Amp.	Cutting Time, Min.	Cross Section Cut per Min. Sq. In.	Cross Section per Min. per 100 Amp. Sq. In.
8 x 8	64	810	27.00	2.37	0.293
8 x 8	64	600	41.75	1.53	.255
8 x 8	64	320	98.00	0.65	.203
6 x 6	36	810	14.50	2.48	.306
6 x 6	36	600	21.67	1.66	.277
6 x 6	36	320	44.33	0.81	.253
4 x 4	16	810	4.70	3.40	.420
4 x 4	16	600	5.62	2.85	.475
4 x 4	16	320	10.08	1.60	.500
2 x 4.5	9	810	2.50	3.60	.445
2 x 4.5	9	600	2.53	3.56	.577
2 x 4.5	9	320	5.05	1.78	.557
1.375 x 3.25	4.47	810	1.10	4.06	.502
1.375 x 3.25	4.47	600	1.17	3.82	.637
1.375 x 3.25	4.47	320	2.25	1.98	.619
.625 x 4	2.5	810	0.67	3.73	.451
.625 x 4	2.5	600	0.83	3.07	.512
.625 x 4	2.5	320	0.88	2.84	.888

Average rate of cutting, 454 sq. in. per min. per 100 amperes.

RIGHT KIND OF DISSATISFACTION.

DISSATISFACTION which moves a man to efforts to better himself is a good thing and is the only kind of dissatisfaction that a man should tolerate in himself. Any man of average mental attainments and health can put himself where he wants to be if he makes up his mind to do so and applies the proper mental force. There is always a place open for the fit man.

Study your work and improve the methods by which it is done. Study the men above you and their methods. Develop your mind, take care of your health, be honest with all men and particularly with yourself, and you will become one of those who have the habit of making good.

The man who does his work as it should be done and studies means by which it can be done better and thus proves his worth to the company as an investment, is the man who gets ahead.

The normal man who sets an objective point for himself and then works steadily toward that point will arrive with a calm, well-balanced mind and with sufficient strength in reserve to carry him through the remainder of his career.

Most men have to work, but comparatively few really like to work; that is, not all men like to do the work they are called upon to do. The other man's work seems so much more interesting. The result is, that a good many men do not give a full day's work for a day's pay. It would be difficult, if not impossible, to get these men to admit that they are dishonest, but that is what it amounts to.

COPPER DEPOSITS IN QUEBEC

THE Copper Deposits of the Eastern Townships of the Province of Quebec, is the title of a report published by the Quebec Mines Branch, under the direction of the Hon. H. Mercier. The author, Dr. J. A. Bancroft, of McGill University has gone thoroughly into the question of possibilities of these deposits, which were worked as far back as 1850. The history of the copper industry in the Eastern Townships is treated at length and is interesting. The various copper mines, prospects and occurrences are described in detail with their geological associations. The information contained, while dispelling illusions regarding some of the deposits and so-called mines, is more likely to attract the attention of serious persons to the mining possibilities of the district than literature which is liable to give misleading impressions. The report is illustrated and accompanied by a map.

Series of Practical Questions and Answers for Mechanics

Every care is being taken to include only pertinent practical questions, and give same direct, reliable answers. Catch questions will be avoided. Arithmetic, consisting of simple addition, subtraction, multiplication and division will be found a useful companion study.

Question.—A shell of 4.5 inches diameter is tested, and found to be 5 ounces over weight, how much must be faced off the base to give the shell the desired weight?

Answer.—A very close method to find the weight of round steel is to divide the square of four times the diameter by 6, for the weight in lbs. of a foot in length. The weight of an inch would be 1-12 of this. By formula we have $W = \frac{(4 \times d)^2}{6 \times 12}$ where W = weight and d = diameter. This would make one inch of steel at 4.5 inches diameter weigh

$$\frac{(4\times4.5)^2}{6\times12} = \frac{4\times4.5\times4\times4.5}{6\times12} = 4.5 \text{ lbs.}$$

or $4.5\times16 = 72$ ounces.

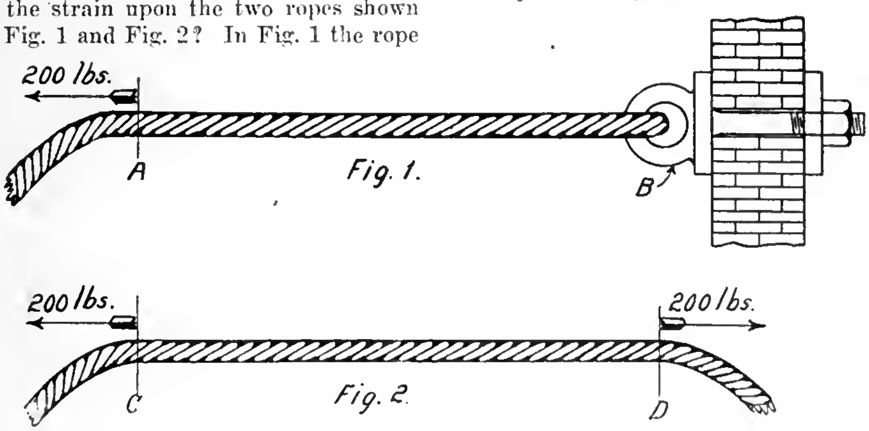
Then the thickness of stock at this diameter, weighing 5 ounces would be 5 divided by 72 or 5-72 = .0695 inches, or a little over 1-16 of an inch.

The approximate length per ounce will be .014 inch.

* * *

Question.—A question came up before a number of men a short time ago, which created considerable discussion. The difference of opinion was such that the writer felt that what would interest a few might also have a similar effect upon the readers of this journal.

The question is, what is the difference in the strain upon the two ropes shown in Fig. 1 and Fig. 2? In Fig. 1 the rope



is secured to an eye bolt in the wall, and a pull of 200 lbs. in the direction of the arrows is exerted at A. In Fig. 2 a pull of 200 lbs. is acting on each end of the rope in the direction of the arrows. It was generally agreed that the strain on the top rope would be 200 lbs., but in the opinion of those interested the strain on the lower rope varied from 200 to 400 lbs. Another interesting point raised was whether the strain was equally divided between the points C and D; some contend that the strain is greater at a point midway between C and D. Any solutions from the readers of this apparently simple problem would be appreciated.—J. R. H.

* * *

Question.—What is a good method to extinguish blazing gasoline?

Answer.—A gasoline fire can usually be extinguished by using flour, sand or earth. If the fire is confined within a small area ammonia will smother it. In some cases where gasoline is used, a supply of ammonia is hung from the ceiling of the room by a fusible link or a piece of string, which is melted in case of fire, allowing the bottle to fall and break, releasing ammonia and putting out burning gasoline.

* * *

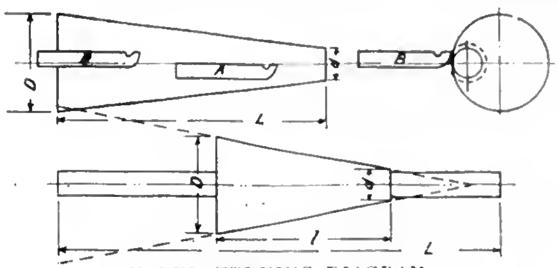
Question.—Could you suggest an easy method of annealing high speed steel?

Answer.—Take a piece of pipe or tubing, large enough, and of sufficient length to contain the piece to be annealed. Provide screw caps for both ends, and after placing in the steel, add about a tablespoonful of resin and screw on the caps. Heat in furnace for six hours and allow furnace, with steel, to cool to atmosphere temperature.

Question.—When turning tapers, what set-over should the tailstock have; and does the position of the cutting point of the tool have any effect upon the shape of the taper?

Answer.—When the taper extends over the complete length, as shown in the upper sketch, the set-over will be approximately one-half the difference between the large and the small diameters. When the taper is only on a portion of the total length, the set-over will be one-half of the extended diameters, as shown in the dotted portion of the lower sketch, or by formula set-over $= \frac{\frac{1}{2}(D-d)L}{l}$

To obtain correct results when turning tapers the cutting point of tool must be in line, horizontally, with the centres of



TAPER TURNING DIAGRAM.

the lathe. On a perfect cone or frustum of a cone the only possible straight line is from the apex to the base, and, as the cutting tool travels in a straight, horizontal direction, it is obvious that any elevation above or below the central position will effect the taper of the piece being turned. This will be clearly seen in the end view of the upper sketch where the full lines indicate the cone as turned with tool on the centre line, while the dotted line shows the difference if tool was elevated above the centre.

* * *

Question. — Without refering to a table, how can I change a decimal measurement to fraction as thirty-seconds, sixty-fourths, etc., with vice versa?

Answer.—To change a decimal to an equivalent fraction whose denominator is known, multiply the decimal by the required denominator and the integral part of the result will be the numerator of the fraction: thus .375 to sixty-fourth

$$.375\times64 = 24.000 \text{ or } \frac{24}{64} = \frac{3}{8}$$

again to change .0469 to the nearest sixty-fourth

$.0469\times64 = 3.0016$ or a shade over 3-64.

To change a fraction to a decimal, divide the numerator by the denominator and proceed to the desired degree of accuracy: thus What is the decimal equivalent of 7-64?

$$7 \div 64 = .109375.$$

BALL BEARINGS

IN a paper read recently by H. J. Moysey, before the Manchester Association of Engineers, on the design and application of ball bearings, the author described the gradual development of this type of bearing from the old cup and cone pattern to that of the present day heavy duty type. He illustrated by means of lantern slides the applications of ball bearings to railway wheel axles, hot saws, ball and tube mills, Crighton openers and scutchers,

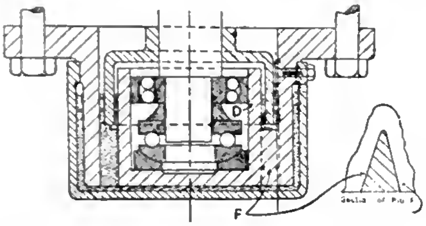


FIG. 1. FOOTSTEP BEARING FOR MORTAR MILL.

cotton ring frames, sizing machines, electric motors and machine tools.

In connection with mortar mills there was described a form of footstep bearing specially designed for the purpose. The mill for which the bearing was constructed was engaged upon the pulverizing of refractory material for the manufacture of furnace linings, the dust from which was very hard, and had to be kept from the bearing surfaces. For this purpose an oil seal was provided, as shown in Fig. 1. Besides having to withstand considerable shocks due to the lumps of material being ground, the bearing had to sustain a load on the footstep of approximately 10 tons, and it had given complete satisfaction. The construction of the bearing will be readily followed from the sketch.

Another interesting application of balls was shown in connection with the central pivot of a railway turntable. As will be observed from Fig. 2, the usual ball and socket centre support has been retained, although it does not now rotate. Its purpose is to allow the bearing to align itself when the table is tilted by the oncoming engine, thus preventing the whole of the load from coming on to a few balls at one side of the bearing. To minimize the expense in altering the table, it was decided that the centres of the bolts on which it hangs must not be increased, and it was therefore necessary to design a bearing that would carry the load with a sufficient factor of safety, with a diameter not exceeding 19¾ in. This made two concentric rows of balls necessary, as shown in the figure.

It was pointed out that in order to ensure that each ring of balls carried its proper share of the load, the lower half of the bearing consisted of two separate concentric steel rings, each forming one race, and these were supported on a sheet of aluminum or other material, which allowed either of the races which happened to be more heavily loaded than the other, to sink in until the load was properly distributed. A brass ring was fitted round the lower portion of the bearing housing to retain the grease.

Immediately before fitting this ball bearing, the table was tested with its old pivot, carrying an engine with a known quantity of coal and water that could be obtained again after the conversion. The total weight of engine and table was approximately 77 tons. The engine was carefully balanced and the pull required to turn it measured by a spring balance applied to the end of the table was found to be 112 lb. When the ball bearing had been fitted the same engine was run on and turned with a pull of 36 lb.

With regard to the application of ball bearings to line shafting, particulars were given of tests carried out on two shafts in different cotton mills in Bombay. In each case a length of shafting was separated from the main drive and driven by an electric motor. Both lengths of shafting were 2½ in. diameter, but were fitted with very different types of bearings, and differently loaded. The first length was 66 ft. long, carried in seven rigid brass-bushed, bottle lubricated bearings, about 1½ diameters long, and drove nine carding machines, the driving pulleys being fitted close to the bearings. The second length was about 150 ft. long, carried in 16 collar and channel bearings, 2½ diameters long, and drove a number of light machines in the preparation room, such as warp winders, bobbin winders, etc. The input to the motor, with all machines at work, was as follows:—No. 1 shaft, 9,114 watts; No. 2 shaft, 6,955 watts. The load was fairly evenly distributed along

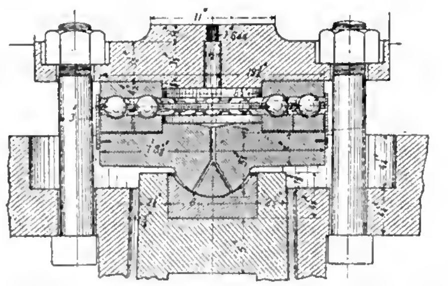
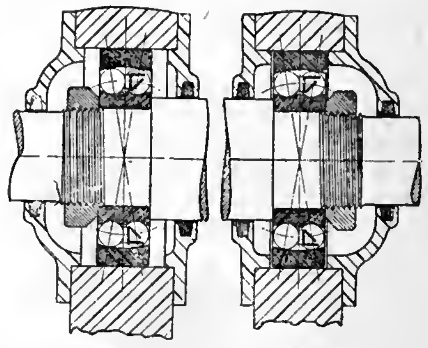


FIG. 2. CENTRAL PIVOT OF RAILWAY TURNTABLE.

each shaft. After replacing the plain bearings by double-row ball bearings the savings were as follows:—No. 1 shaft, 1,742 watts; No. 2 shaft, 1,764 watts.

Surprise was expressed that ball bearings had not been adopted to a greater extent for the shafts of electric motors, and figures were quoted to show the saving of current which could be effected by replacing the ordinary bearing by balls. Some makers, the author said, had been adversely influenced by unfortunate experiences with their first attempts, one of the most common troubles in the early days arising out of making the inner race of the bearing too slack a fit on the shaft, with the result that it crept round and gradually wore the shaft away, necessitating not only a new bear-



FIGS. 3 AND 4. METHOD OF MOUNTING "SKEFKO" BEARINGS ON ELECTRIC MOTOR.

ing, but a new shaft. Other makers provided too small housings, so that the outer race was a driving fit, which was unnecessary and liable to lead to trouble. The author said that unless one bearing was free to move endwise in its housing, excessive end thrust was set up when the motor heated under load and the shaft expanded; and in the second place, if the housing was not perfectly circular in the bore, as might happen through the casting having been sprung somewhat in chucking in the lathe, the outer race of the bearing would be distorted to correspond with the housing, unless it was an easy fit, and would thus put an uneven load on the balls.

Figs. 3 and 4 are sectional views showing the Skefko method of mounting the bearings of an electric motor, the inner race being a tapping fit on the shaft and the outer race such that it can be pushed in by hand. It will be observed that the bearing, Fig. 4, on the right hand is fixed endwise between the housing covers, which prevents any movement of the rotor endwise; whereas the bearing, Fig. 3, on the left has freedom to slide in its housing as the shaft expands or contracts, and also to allow for any inaccuracies of machining.

What is efficiency? Is it not doing a thing in a clean, quick, competent way? Is it not doing a thing with the least expenditure of brain and force? Is it not doing a thing the way a thing ought to be done. Efficiency means effort; it means study; it means the development of our own powers; it means applying those powers to every task.—H.N.C.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

APPLICATION OF SPRING PINS TO JIGS AND FIXTURES.

By F. Scriber.

As a unit in the successful operation, and a large factor in the correct design of jigs and fixtures, and in most all branches of machine design, the use of pin arbors and spring pins in various combinations, plays a very important part, often contributing largely to the smooth running of a machine and eliminating noise or bracing some weak portion of a part being machined, in a jig or fixture. The object of this article is to show some of the arrangements and applications in the use of these pins, that have proved themselves, and which it is hoped will be suggestive of the general design of the pins which, very often owing to their construction cannot be seen as they are partly and often entirely out of sight or covered up by the general construction of the mechanism of which they form a part.

Perhaps the simplest construction of a spring pin and also a very common one is shown in Fig. 1, and consists of a plain round pin, A, with a spring B in the back of it, the same being placed in a hole in the body of the machine or frame casting in the manner shown, to perform the simple function of acting on the lever C, to push the rod D, and pull the connecting link E, with whatever mechanism is attached thereto, back to its starting point in the direction of the arrow, after the same has been pushed forward by the rod D. This style of pin is often used to return tripping levers to their proper place after tripping or as a cushion to prevent levers or other mechanism from pounding back into position after being released when their function is performed.

Locking Devices.

Other common types of jig pins are shown by Fig. 2 and 3, these being simple and effective, and consist of, at the left, Fig. 2, a pin A, with the spring B, under it and a screw, C, to bind the pin in place after the spring has pushed the pin up against the work being machined. At the right Fig. (2a) is shown a similar arrangement with the exception that instead of having the screw placed on an angle to bind the pin the screw Y, is placed at right angles to the pin x, as shown by the illustration with the shoe Z, beveled on the end, between the screw and pin. This method of binding is used in the illustration Fig. 4, which shows a complete method for holding the work as shown while drilling the holes X and Z. This jig is used in the following manner. The work is set on the steel seat A, and the pin B, and is located in the jig by a screw bushing C, bell-mouthed at the end to centralize the boss and at the same time to hold the work down on the seat. At

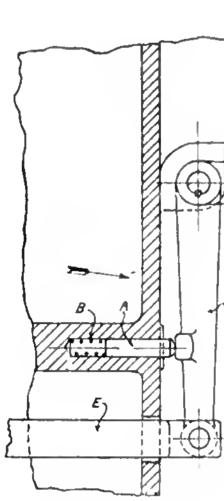


FIG. 1.

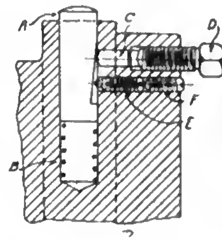


FIG. 3.

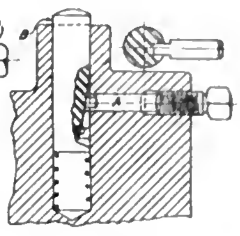


FIG. 3a.

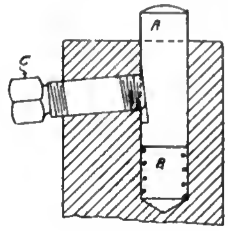


FIG. 2.

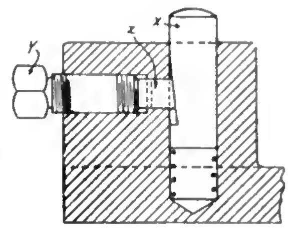


FIG. 2a.

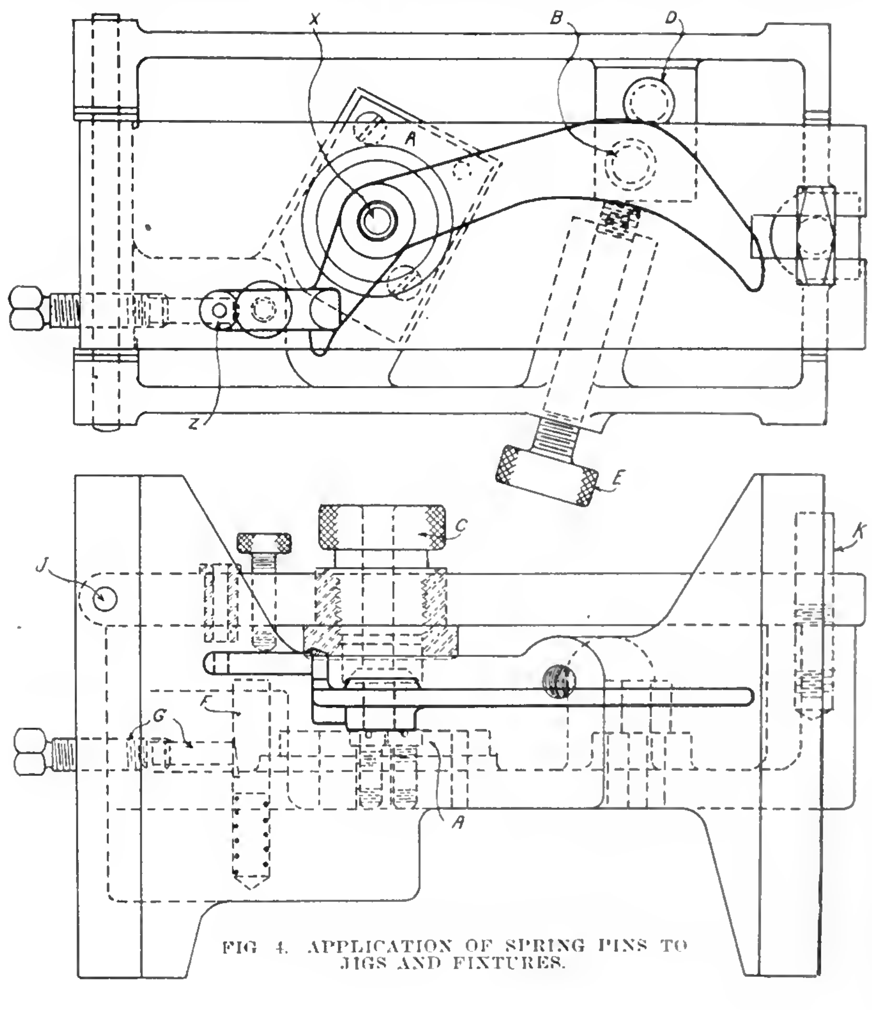


FIG. 4. APPLICATION OF SPRING PINS TO JIGS AND FIXTURES.

the end, the work is pushed against a pin D, by the screw E, and although this would be sufficient for drilling the hole X, some form of support must be used for the hole Z. This is taken care of by having the spring pin F, with binding screw and shoe G, as previously described, come as shown, under the tail of the work where the drilling is done. A small holding-down knurled screw comes on the work over the spring pin to steady it. To permit the easy removal of the work from this jig the drill bushings and holding-down screws are held in a swinging cover which can be swung out of the way, and when in operation this cover is held in place by the quarter turn screw K. All of these units make an accurate, neat and convenient method for holding the work shown, and the whole is held in a suitable cast iron frame.

The other types of pins previously mentioned Fig. 3, are of the same general construction as those in Fig. 2, but are more refined. The one at the left has in addition to the pin A, spring B, shoe C, and screw D, a small screw E, to prevent the pin from springing out of the hole or from turning should the binding screw D, be released sufficiently to permit this. The other small screw F, acts as a check screw to prevent screw E from working back out of place. At the right, Fig. (3a), the shoe A, is flattened on the sides to go into the slot in the pin B. This is a good construction but necessitates the drilling of a hole in the pin at C, to permit the tool to machine the slot.

NO LIFT MACHINE VISE

A MACHINE vise for use in connection with planers, shapers, etc., and which possesses the necessary qualifications that it holds fast and does not lift or displace the work when the grip is applied has recently been designed and patented by J. Parkinson & Sons, Shipley, England.

By referring to the illustrations an idea of the simplicity of the vise may be obtained. It consists of four parts, the base A, Fig. 1, the loose jaw B, the dog nut C, and the screw D. The three last mentioned are also shown in detail, in Figs. 2 and 3.

The base A is rigidly constructed with

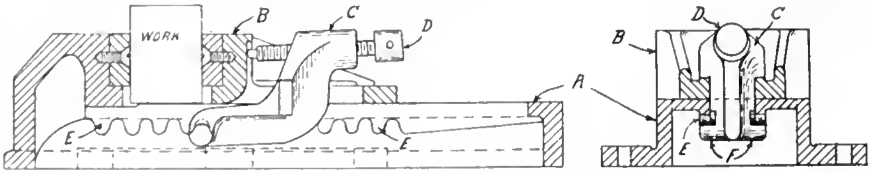


FIG. 1. NO-LIFT MACHINE VISE.

rack teeth E, formed on the under side, which engage with the projections on the dog nut when the latter is inserted. The fixed jaw as well as the loose jaw has renewable hardened steel jaw plates which are fastened in place as shown by means of countersunk set screws.

The dog nut is provided with projection F on either side, which engage with the rack teeth as previously mentioned,

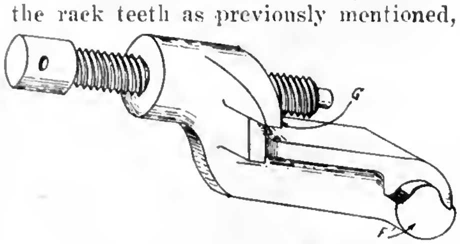


FIG. 2. DOG NUT WITH SCREW.

while shoulder G rests on the raised surfaces of the loose jaw. The clamping screw is threaded through the boss of the dog nut at a slight angle.

In clamping a piece of work all that is necessary is to raise the screw thus disengaging the projections with the rack. The loose jaw and dog nut are then moved forward till the projections and rack are engaged, and the screw is then tightened. Since the screw will have a downward pressure on the projections G, it will be seen that increased pressure tends to bind the jaw more firmly to the base, and at the same time eliminates the possibility of the work lifting.

Other noticeable features about this vise are the movable or swivel jaw which permits work of a tapered nature

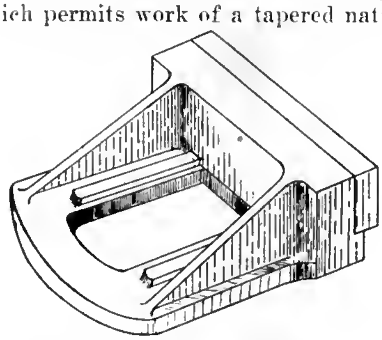


FIG. 3. LOOSE JAW.

to be held securely. Also if the vise should become worn it may be restored to its original accuracy by planing the upper and lower surfaces of the bed.

Winnipeg, Man.—Permits and buildings, numbering 1,274 and 1,304 respectively, and of a total value of $1,826,300, are reported by the Inspection of Buildings Department, Winnipeg, Man.

ELECTRIC PRODUCTION OF STEEL DIRECT FROM IRON ORE

THE production of steel direct from iron ore has been the subject of considerable experiment during recent years, and the measure of success which has attended various efforts indicates the probability of successful commercial development when normal conditions return.

The Tivani Electric Steel Company has been operating an electric smelter at Belleville, Ont., for some months, and their results have demonstrated the practicability of smelting suitable ores directly into tool steel.

The principal item of the plant is the furnace, which is operated on two-phase current. Threaded electrodes are used, 3 in. dia. arranged to feed continuously, and can be almost entirely consumed with little waste. A feature of the furnace is the provision of a preheater for utilizing waste heat from the gases given off by the furnace during smelting. This device is formed of two wrought iron pipes, about 8 ft. in length x 14 in. dia. at one end, increasing to 18 in. at the other. This inverted funnel shape facilitates the downward progress of the charge during heating. A suitable stack encloses the preheater, baffles being arranged so that the gases pass over the surface of the preheater in the most efficient manner.

Charging is done from the upper floor; iron ore, limestone, and charcoal being fed into the upper end of the preheater. The ore smelted is specially selected for freedom from sulphur and phosphorous, only a trace of the former and 0.004 per cent. of the latter appearing in the analysis. The average analysis of the ore shows small quantities of chromium and manganese and 50 per cent. iron, with 7.5 per cent. titanium, 0.11 per cent. vanadium, and 0.34 per cent. nickel.

This titaniferous ore has been used for the production of a tool steel, which is reported to show up well against high-speed steel. Tests have shown that for turning cast iron and 0.90 per cent. carbon steel, tools made of this material would stand up at the same speed as high-speed steel, although attempts to machine low carbon steels at a higher speed were not so successful.

By mixing crude chrome ore with titaniferous ore a fair quality of chrome steel has been produced. Future developments, which include the erection of a 3-ton furnace for the production of tool steel and steel castings, are awaited with considerable interest.

Victoria, B.C.—Building permits during 1915 were considerably below the average, 214 permits, only having been issued of a total value of $291,750.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

PNEUMATIC FFOUNDRY APPLIANCES

THE accompanying illustrations show two of the many air operated foundry appliances manufactured by the Cleveland Pneumatic Tool Co. of Canada, Ltd., Toronto, Ont. The sand rammer, Fig. 1, is adapted for floor work and has an extension handle which may be made any length to suit the height of operator. Blows at the rate of 650 per minute, according to the distance from the work are delivered, and various sizes of butts or peins can be fitted as required. Round or flat rods can be used the flat rod preventing the pein from turning in operation.

FIG. 1. SAND RAMMER FOR FLOOR WORK.

An exhaust deflector is fitted which deflects the exhaust air and moisture downward into the sand, preventing the cold air and water from affecting the operator. The packing chamber is separate from the piston chamber, and an attachment is provided to compress the packing as it wears. The resilient packing employed prevents the entrance of any dirt or grit which is so injurious to the working parts.

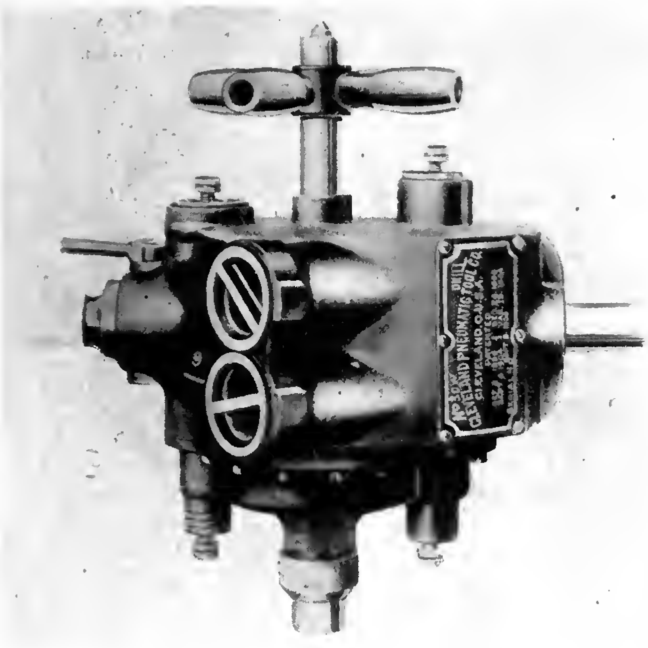
These rammers are made in five sizes and styles adapted for all classes of work such as bench and core work, heavy loam, pein and flask ramming. The centre spindle four piston Air Drill shown in Figs. 2 and 3, is one of 58 types made by this concern. The construction is alike in all types, varying only as to the size of the machine, and gear ratio for spindle speeds. The interior view shows the simplicity of construction, the fewest possible number of parts for satisfactory service being employed. The cylinder body, in which are assembled the component parts, is a one piece steel casting with hand hole openings for access to chank and connections.

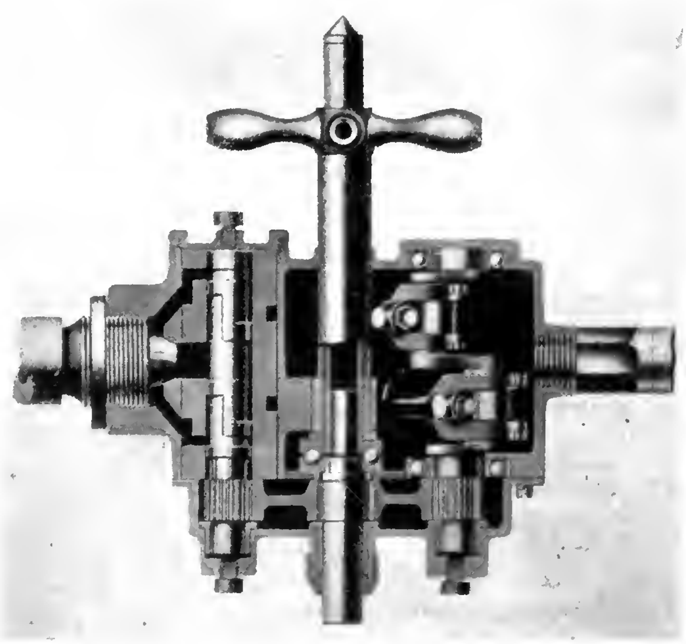
The main valve, at the left of the casing is of the rotary type, and revolves in a renewable valve bushing. It is hollow and acts as an oil reservoir. A selected grade of steel is used for this part which is hardened and ground. On the lower end of the valve is a driving pinion which meshes with the main spindle gear which in turn is driven by the pinion on the crank shaft.

The driving crank is a high-grade drop forging, hardened, ground, and mounted in annular ball bearings located close up to the crank arms or webs, maintaining its rigidity under heavy loads. The connecting rods are drop forgings, secured to the pistons by a ball and socket joint which allows of universal motion. The complete enclosing of the crank chamber allows it to be filled with heavy lubricant which maintains all the working parts in a state of high efficiency.

Another appliance, not illustrated, is a corner drill for performing work in close quarters. The body casting of this machine is designed so that one side of it, in which the spindle is mounted, may project into corners. Two cylinders only are used in this design so that the general shape is narrowed down considerably. Two ratchet arms on the spindle are oscillated by the crank shaft, thus acting as a reducing gear and dispensing with a large diameter gear wheel. The rotary valve is replaced by an eccentrically operated piston valve located between the cylinders, the whole arrangement approximating to the straight line design.

All parts are interchangeable and renewable from stock, and working parts of steel are hardened and ground.



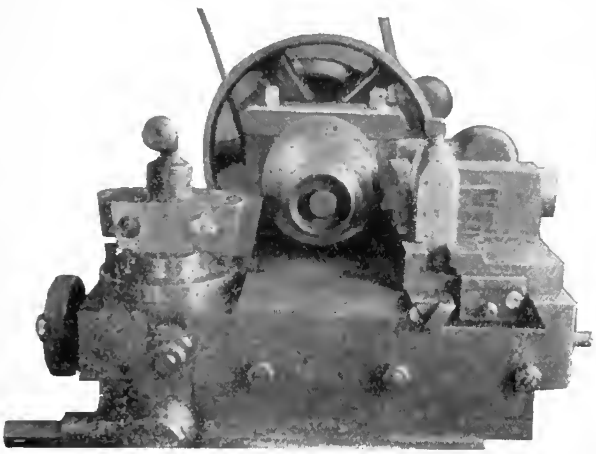


FIGS. 2 AND 3. CENTRE SPINDLE FOUR PISTON AIR DRILL.

SHELL PLUG CHASING ATTACHMENT

THIS device has been designed for chasing threads on cast iron plugs used for protecting the noses of shells during shipment. It can be fitted to any type of lathe above 6 in., but not exceeding 13 in. swing. In addition to this attachment all that is required is a headstock with a 3 in. belt, running on a 9 in. dia. pulley, mounted on a suitable bed, and fitted with a tailstock or turret.

Two methods of production are possible, one involving two operatins, and the other only one. Method A. 1st operation, chuck and drive by square hole. Form thread with tool on front of slide. Bring slide back to stop. Lift up lever which engages nut with lead screw, and at the same time bring chaser on to work. At end of stroke release the lever; the slide automatically returns to original position and in three repetitions of this motion cuts a perfect thread. Second operation, screw into chuck and form.



SHELL PLUG CHASING DEVICE

Method B, in one operation: Fit on to square arbor, and bring up steady fitted in tailstock or turret. Form complete and cut thread same as method A. This method can only be adopted with success when the squares are correct size and central in the body of the casting.

The attachment forms and threads one complete 18 pdr. plug in one minute, and a continuous output of 45 plugs per hour is guaranteed.

The makers of this chasing attachment are the Arnold Thompson Tool Co., Woodstock, Ont.

SAFETY GLASSES FOR METAL WORKERS

THE vital need for eye protection is being more widely recognized in all branches of the metal working trades, and the use of goggles is slowly but surely increasing where workmen are chipping, grinding, boring, turning, working with hot metals, etc. The recent enactment of various workmen's compensation acts, along with the strict requirements of liability companies, makes it a matter of economy as much as humanity for employers to provide adequate eye protection.

T. A. Willson & Co., Inc., Reading, Pa., have made an exhaustive study of actual

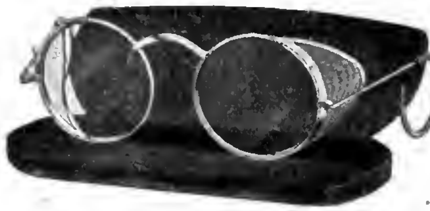


FIG. 1. STYLE MI

working conditions, in consultation with many of the foremost safety engineers, and the accompanying illustrations show three of their many styles of goggles adapted for various conditions.

In Fig. 1 is shown a light substantial goggle specially designed for grinders and men doing light work. It is made entirely of rust proof white metal, has an adjustable bridge, and fine wire screen sides with comfortable half cable temples. The provision of screw-joint end pieces makes the replacement of lenses easy.

Style SG2 (Fig. 2) is another grinder's style of lower price. This has well ventilated leather side guards, adjustable bridge and soft cable temples.

Chemists and similar workers who require protection from acids, gases, and fine dust have their requirements met in style A1 (Fig. 3). This eye protector gives protection from all angles and can be easily adjusted to fit the curves of the face. Soft leather sides, and cable temples insure complete comfort. The provision of adequate side protection is a special feature of this firm's product

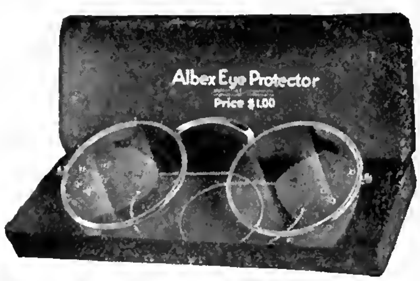


FIG. 3—STYLE A1

as investigations of engineers who have studied actual grinding conditions prove that much grit and dust will whirl around the sides of unprotected glasses.

All of the styles are furnished in a strong steel case, and are designed to slip over ordinary spectacles or eye glasses.

RELATIVE EFFICIENCY OF ROLLER AND BALL BEARINGS

AS the result of tests recently carried out at the University of Wisconsin to ascertain the relative efficiency of white metal, roller and ball bearings, it was found that in all cases the power per bearing—measured in watts—diminished with temperature up to about 100° Fah., after which there was a tendency for it to become constant.

There was a considerable increase of power required in respect of speed. Thus, at 80° Fah., with a 730-lb. load, and for white metal, the power was 13 watts at 150 revolutions, 30 watts at 250 revolutions, 48 watts at 350 revolutions, and 74 watts at 450 revolutions. The corresponding figures for roller bearings were 10, 19, 28 and 40 watts, and for ball bearings, 3, 7, 10, and 18 watts.

The co-efficient of friction followed approximately the temperature law. For white metal bearings the co-efficient was 0.005 to 0.015; for roller bearings 0.004

FIG. 2—STYLE SG2

to 0.011; and for ball bearings 0.0015 to 0.003.

Breakdown tests were made by increasing the load until there was a sudden rise of temperature, with the following results:—White metal, 4,250 lb. per bearing; roller bearings, 5,100; and ball bearings, 4,650 lb.

CONCERNING DRILLS

A FACT often lost sight of, even by experienced users of drills, is that cutting ability and hardness are not the same thing. This is especially true of high-speed drills, the apparent hardness of which varies with the composition of the steel, and is no indication of cutting ability. Some of the best high-speed tools we have ever tested could be filed so readily that if this were any indication of the work to be expected of them, they would be condemned without a working trial. A high-speed drill that cannot be filed may, by exercising the greatest care, be made to drill extremely hard material successfully; but for softer materials, or where a large amount of work must be done in a given time, it will be found so brittle as to be worthless.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - General Manager
H. V. TYRRELL - - - - - Asst. General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor.

Associate Editors,
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

B. G. NEWTON - - - - - - Advertising Manager
Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. JANUARY 13, 1916 No. 2

IN TIME OF WAR PREPARE FOR PEACE

SPECULATION as to the future may be reckoned as meantime exercising in large part the minds and giving bent to the activities of metal-working plant interests, both neutral and belligerent, yet it is quite apparent that all conclusions arising therefrom may be classed as being evolved from processes of "dead-reckoning." There is a growing presentiment that the current year will see peace declared, and, with each succeeding month, we expect the evidences to become more marked; in consequence, commercial activities should develop correspondingly.

It is, of course, quite natural that we should be disposed to peer into the future—and such a future for it is without precedent and perhaps more imminent than many of us realize. We are of opinion that the war is likely to end quickly and abruptly, but have no sympathy with the idea that a peace little better than a pro-tem truce will be the outcome. The Allies are out for a lasting peace and need not fail to make it a reality. Manufacturers who anticipate only a truce figure that little interruption to production of both tools and munitions will result, and no doubt "the wish is father to the thought."

It is a healthy sign, however, this widespread interest in post bellum conditions, and not only should it become all-pervading in its scope, but it should evidence well-defined preparation on the part of our plant managements to be able to grasp the immediate and subsequent opportunities as they arise. The excitement due to the establishment of shell-making in Canada has quite died down, the industry, in spite of its importance and magnitude, being now considered somewhat commonplace. This, perhaps, is just as it should be, because tending to broaden the outlook.

On the outbreak of war we were bidden capture Germany's trade; we were soon made to realize, however, that the task of fighting Germany was the first consideration and it still occupies a place of much importance. We didn't even get the length of organizing for trade capture, and it is just as well, for it certainly would have been done hurriedly, and therefore badly; further, we did not then have the experience that twelve month's munitions manufacture has given us. We, as well as the Motherland, have been taught in the interval that men and munitions in number and quantity almost fabulous, and skill and administrative capacity before undreamt of and therefore unappreciated, have had to be requisitioned for the task.

What has been our experience in these respects is indicative of the commercial struggle for the world's markets that the end of the war will usher in. Germany entered into the war fully prepared, and alone in that capacity. Evidences are not wanting that, although her progress has been effectively barred in that particular enterprise, she will, on the declaration of peace, enter the world's trade and commerce markets equally prepared and with her plans developed to utilize her resources to the utmost. In time of war she is preparing for peace, just as in the peace days she prepared for war.

It has been suggested that manufacturers who, in the midst of war's alarms and war's activities, have both given thought and effect to the production of commodities for which there will be sure and certain demand immediately following the declaration of peace, will naturally reap a substantial reward for their foresight, the latter, notwithstanding, being free for all. The immediate drawback to this procedure is that capital is tied up in product, and interest return is nil meantime and while the war lasts. The plant that neither plans for its peace time product nor gets to work on it now, is sure to find itself forestalled later.

It has been said that, in the last analysis, Germany, while regarding the war as a disagreeable episode, deems it perhaps worth more than it will cost, looking forward as she does to more than regaining her position in the world's markets. Do we in Canada realize fully that we have to win and hold our own domestic market in addition to branching out, the latter of which we must, for only by so doing will we divert attention and offset and stem highly competitive imports invasion.

CO-OPERATIVE ACHIEVEMENT

PROBABLY the most outstanding and possibly most permanent-in-result feature of shell manufacture in Canada has been what might aptly be termed the esprit de corps exhibited by our metal-working plant managements. Little disposition has been apparent or expression given of the desire to limit and circumscribe production achievement or to secure a monopoly of orders for war munitions. In a word, co-operation to no insignificant degree has been practised, and not only has shell output been enlarged correspondingly, but a standard of staff and operator efficiency has been realized that under the more or less universally obtaining pre-war conditions would have remained inert.

It is doubtless true that with the return of competition in the open market, and the passing of patriotic fervor, there will disappear some, at least, of the co-operative spirit now prevailing, at the same time, and in the very nature of things, sufficient must necessarily remain to have a permanently marked effect on our future industrial relationships. The accomplishment and for all time establishment of even a little in the direction indicated will be not the least of many benefits accruing to us from shell manufacture, and will form no inconsiderable portion of our war-participation reward. Hesitancy to share our knowledge, even in part, and our systems and methods of applying same, is a development of the ages, and therefore hard to be modified, much less eradicated. We believe, however, that the "common cause" idea, arising from the war, will have been sufficiently long operative and will have proved itself so constructively effective as to insure permanent embodiment to some degree in the future plans of those responsible for our industrial enterprises, irrespective of product.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 25	
Ferro nickel pig iron (Soo)	25 00	
	Montreal.	Toronto.
Middlesboro, No. 3	$24 00	.....
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Glengarnock	28 00	.....
Summerlee, No. 1	33 00	.....
Summerlee, No. 3	32 00	.....
Michigan charcoal iron.	28 00	.....
Victoria, No. 1	27 00	.....
Victoria, No. 2X	26 00	.....
Victoria, No. 2 plain	26 00	.....
Hamilton, No. 1	23 00	24 00
Hamilton, No. 2	23 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	2.75
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	2.75
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	2.40
Structural shapes	2.50
Plates	2.50

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in., 100 lb.	$2 75	$2 75
Heads, per 100 lb.	3 10	3 00
Tank plates, 3-16 in.	3 00	3 00

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$15 25	$15 00
Copper, crucible	18 50	17 00
Copper, unch-bled, heavy	17 25	16 50
Copper, wire, unch-bled.	17 25	16 00
No. 1 machine compos'n	14 00	13 00
No. 1 compos'n turnings	11 25	10 00
No. 1 wrought iron	11 75	11 00
Heavy melting steel	9 75	10 00
No. 1 machin'y cast iron	14 75	14 00
New brass clippings	11 75	11 00
No. 1 brass turnings	9 75	9 00
Aluminum	30 00	30 00
Heavy lead	5 40	5 50
Tea lead	$ 4 40	$ 4 35
Scrap Zinc	13 00	12 00

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect Dec. 14, 1915:

	Buttweld Black Standard	Gal.	Lapweld Black	Gal.
1/4, 3/8 in.	60	36 1/2	....	....
1/2 in.	65	45 1/2	....	....
3/4 to 1 1/2 in.	70	50 1/2	....	....
2 in	70	50 1/2	66	46 1/2
2 1/2 to 4 in.	70	50 1/2	69	49 1/2
4 1/2, 5, 6 in.	....	....	67	47 1/2
7, 8, 10 in.	....	....	64	42 1/2
X Strong P. E.				
1/4, 3/8 in.	53	36 1/2	....	....
1/2 in.	60	43 1/2	....	....
3/4 to 1 1/2 in.	64	47 1/2	....	....
2, 2 1/2, 3 in.	65	48 1/2	....	....
2 in.	....	....	60	43 1/2
2 1/2 to 4 in.	....	....	63	46 1/2
5 1/2, 5, 6 in.	....	....	63	46 1/2
7, 8 in.	....	....	56	37 1/2
XX Strong P. E.				
1/2 to 2 in.	41	24 1/2	....	....
2 1/2 to 6 in.	....	....	40	23 1/2
7 to 8 in.	....	....	37	18 1/2
Genuine Wrot Iron.				
3/8 in.	54	30 1/2	....	....
1/2 in.	59	39 1/2	....	....
3/4 to 1 1/2 in.	64	44 1/2	....	....
2 in.	64	44 1/2	60	40 1/2
2 1/2, 3 in.	64	44 1/2	63	43 1/2
3 1/2, 4 in.	....	....	63	43 1/2
4 1/2, 5, 6 in.	....	....	60	40 1/2
7, 8 in.	....	....	57	35 1/2

Wrought Nipples.

4 in. and under	75%
4 1/2 in. and larger	70%
4 in. and under, running thread	55%
Standard Couplings.	
4 in. and under	57 1/2%
4 1/2 in. and larger	37 1/2%

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto.
Lake Copper, carload	$27 00	$26 00
Electrolytic copper	27 00	25 75
Castings, copper	26 00	25 50
Tin	45 00	45 00
Spelter	21 00	20 00
Lead	7 25	7 50
Antimony	45 00	40 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$32 00
Open-hearth billets, Pittsburgh.	33 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	40 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 00	$3 05
Cut nails	2 90	2 90
Miscellaneous wire nails	75 per cent.	
Pressed spikes, 5/8 diam., 100 lbs.	3 25	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	65 and 5
Stove bolts	82 1/2
Plate washers	40
Machine bolts, 3/8 and less	60
Machine bolts, 7-16 and over	50
Blank bolts	50
Bolt ends	50
Machine screws, iron, brass	35
Nuts, square, all sizes	3 1/4c per lb. off
Nuts, hexagon, all sizes	3 1/2c per lb. off
Iron rivets	67 1/2
Boiler rivets, base, 3/4-in. and larger	$4.00
Structural rivets, as above	4.00
Wood screws, flathead, bright	85 p.c. off
Wood screws, flathead, brass	62 1/2 p.c. off
Wood screws, flathead, bronze	57 1/2 p.c. off

LIST PRICES OF W. I. PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong, Sizes Ins.	Price per ft.	D. Ex. Strong, Size Ins.	Price per ft.
1/8in	$.05 1/2	1/8in	$ .12	1/2	$ .32
1/4in	.06	1/4in	.07 1/2	3/4	.35
3/8in	.06	3/8in	.07 1/2	1	.37
1/2in	.08 1/2	1/2in	.11	1 1/4	.52 1/2
3/4in	.11 1/2	3/4in	.15	1 1/2	.65
1 in	.17 1/2	1 in	.22	2	.91
1 1/4in	.23 1/2	1 1/4in	.30	2 1/2	1.37
1 1/2in	.27 1/2	1 1/2in	.36 1/2	3	1.86
2 in	.37	2 in	.50 1/2	3 1/2	2.30
2 1/2in	.58 1/2	2 1/2in	.77	4	2.76
3 in	.76 1/2	3 in	1.03	4 1/2	3.26
3 1/2in	.92	3 1/2in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4 1/2in	1.27	4 1/2in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	....	....
7 in	2.38	7 in	3.81	....	....
8 in	2.50	8 in	4.34	....	....
8 in	2.88	9 in	4.90	....	....
9 in	3.45	10 in	5.48	....	....
10 in.	3.20	....	....	....	....
10 in.	3.50	....	....	....	....
10 in.	4.12	....	....	....	....

COKE AND COAL

Solvay Foundry Coke	$6.50
Connelsville Foundry Coke	5.95
Yough Steam Lump Coal	3.98
Penn. Steam Lump Coal	3.88
Best Slack	3.25

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	25%
At warehouse	15%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS

Solder, half-and-half	0.24½
Putty, 100-lb drums	2.95
Red dry lead, 100-lb. kegs, per cwt.	9.65
Glue, French medal, per lb.	0.15
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.27½
Benzine, single bbls., per gal.	0.27
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	0.98
Linseed oil, boiled, single bbls.	1.01
Plaster of Paris, per bbl.	2.50
Plumbers' Oakum, per 100 lbs.	4.50
Lead Wool, per lb.	0.11
Pure Manila rope	0.16
Transmission rope, Manila	0.20
Drilling cables, Manila	0.17
Lard oil, per gal.	1.10
Union thread cutting oil	0.60
Imperial quenching oil	0.35

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 40%

PROOF COIL CHAIN.

¼ in.	$9.00
5-16 in.	5.90
⅜ in.	4.95
7-16 in.	4.55
½ in.	4.00
9-16 in.	4.20
⅝ in.	4.10
¾ in.	3.95
⅞ in.	3.80
1 inch	3.70

Above quotations are per 100 lbs.

TWIST DRILLS

	%
Carbon up to 1½ in.	55
Carbon over 1½ in.	25
High Speed	
Blacksmith	55
Bit Stock	60 and 5
Centre drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 50	$3 50
Canada plates, dull, 52 sheets	3 40	3 60
Canada Plates, all bright	4 60	4 75
Apollo brand, 10¾ oz. galvanized	6 00	6 50
Queen's Head, 28 B.W.G.	6 50	6 00
Fleur-de-Lis, 28 B.W.G.	6 00	5 75
Gorbal's Best, No. 28	6 10	6 10
Viking metal, No. 28	5 50	5 25
Colborne Crown, No. 28	5 70	5 80
Premier No. 28	5 50	6 25
Premier, 10¾ oz.	5 75	6 50

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$17 00	.....
1¼ in.	17 00	.....
1½ in.	17 00	.....
1¾ in.	17 00	.....
2 in.	18 00	10 00
2¼ in.	20 00	11 00
2½ in.	21 00	12 85
3 in.	28 00	13 20
3½ in.	32 00	16 25
4 in.	38 00	20 75

Prices per 100 feet, Montreal and Toronto.

WASTE.

WHITE.	Cents per lb.
XXX Extra	0 13½
Grand	0 12½
X L C R	0 11¾
X Empire	0 10¾
X Press	0 10¾
COLORED.	
Lion	0 08¾
Standard	0 08
Popular	0 07
Keen	0 06
WOOL PACKING.	
Arrow	0 20
Axle	0 14
Anvil	0 10
Anchor	0 08
WASHED WIPERS.	
Select White	0 09
Mixed Colored	0 07
Dark Colored	0 05½

This list subject to trade discount for quantity.

BELTING RUBBER

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$12.75
3-16 in.	8.85
¼ in.	6.15
5-16 in.	4.90
⅜ in.	4.05
7-16 in.	3.85
½ in.	3.75
⅝ in.	3.60
¾ in.	3.60

Prices per 100 lbs.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.06
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy.	.30
Copper sulphate	.15
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	3.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.20
Zinc sulphate	.07

Prices Per Lb. Unless Otherwise Stated.

ANODES

Nickel	.47 to .52
Cobalt	1.75 to 2.00
Copper	.27 to .30
Tin	.45 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs	.4½ to .06
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.04 to .06
Emery composition	.07 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., Jan. 10, 1916.—Encouraging conditions prevail throughout the metal working industries. Shell making is progressing without abatement, and the first week of the new year finds Canadian factories busier than at any similar period for many years. Production of the 8 and 9.2-inch shells is expected to commence within a month, and this will add considerably to the present shell making activity. A great deal of inconvenience is being experienced through the lack of transportation facilities both on land and water. The shipment of supplies and material meets with much delay owing to the shortage of cars on shore and of "bottoms" afloat.

During the past year many steamers employed in the fishing and sealing trade along the Atlantic coast have been requisitioned by the British and French Admiralties for transport purposes, and, to in some measure compensate for this, it is believed that many wooden sailing vessels will be constructed this year to take their place.

Pig Iron

Following the quiet of the holiday season, the market has taken on an interesting aspect, and heavy inquiries for second-quarter iron has been a feature. This has caused some of the producers to advance their quotations on pig, and the revised lists show substantial increases. Local dealers are now asking $26 for Clarence, No. 3; $33 for Summerlee, No. 3; $27 for Victoria, No. 1, and $26 for other grades of Victoria.

Steel

The steel situation still evidences the activity it has shown for many months. There is every probability of increased production in the immediate future, as facilities towards same are constantly being added to present plants. Munition requirements still hold premier place in the steel market. Following the advances on hot-rolled steel, many lines of manufactured product have been increased in price. Twisted reinforced bars show an increase of 3-10 cent per pound, having advanced to 2.80 cents per pound. Structural shapes and plates have advanced to 2.60 cents per pound, with the producers unwilling to accept very heavy orders for future delivery, even at this figure. Boiler heads are stronger, and this week's quotation of $3.10 per hundred shows an increase of 1-10 cent per pound.

Sheets

The demand for black sheets is still very heavy, and many producers are falling behind in supplying requirements. The price remains firm at $3.50. Canada plates (dull) have advanced to $3.40, while bright sheets are strong at last week's price of $4.60. Apollo and Queen's Head have both advanced 50 cents, and Fleur-de-Lis, with an increase of 25 cents, is quoted at $6. Viking metal, 28-gauge, has advanced from $5.25 to $5.50.

Metals

With the exception of lead and antimony, little change is noted in this week's market. The action of the British Minister of Munitions in cautioning consumers regarding prices paid for refined copper may tend to maintain a steady and firm tone to the copper market. However, what effect this will have upon the market here is not yet clear. It would not be surprising to see some advance upon present prices. Lead has become still stronger, following heavy inquiries from foreign agents, while antimony has shown a sharp advance owing to the apparent scarcity of available supplies.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Copper.—The market is still buoyant, with prospects of added strength within a short time. Further advances are looked for; but the British authorities have, during the past week, endeavored to prevent any excess speculation on the part of dealers by notifying customers in Great Britain not to pay in excess of £100 per ton for refined copper. However, if consumers feel that they must have the metal and are willing to pay the price, there would be nothing to prevent them doing so. Many producers have orders sufficient to keep them busy for some months, and in view of a heavy foreign demand, they are trying to avoid taking on business for future delivery, believing that before long prices may be higher than those at present quoted. The present outlook seems to point to higher quotations. Prices this week remain firm, with the market strong and steady.

Tin.—With a falling off in the number of inquiries, the present market is weaker than that of the previous week, but the reports of submarine activity in the Mediterranean contribute to a rather uncertain condition. The difficulty of obtaining shipping permission from England has also had the effect of producing a somewhat dull tone. Local conditions are slightly weaker, but prices remain firm at 45 cents per pound.

Spelter.—The situation is unchanged, and the market remains quiet. Very few inquiries are being received, early future deliveries are dull, although this month's shipments are fairly active. Dealers are quoting last week's prices of 21 cents per pound.

Lead.—Lead has been gradually advancing, and the market is very strong. It is expected to go still further during the coming month. The situation abroad and the continued foreign demand have been leading factors in the later advances. Domestic inquiries are also helping to maintain the firmness. Local dealers are asking $7.25 per hundred, being an advance of 25 cents over last week.

Antimony.—With increased inquiries and a scarcity of this metal, the market at present is very strong. Early shipments are expected, but the fact that these are already sold helps further to strengthen the market. This week's quotation shows an advance of 3 cents per pound, with dealers asking 45 cents.

Aluminum.—Little activity is shown in the market at present, and prices remain firm at 68 cents.

Machine Tools and Supplies

Conditions are unchanged from those of the past few weeks. Inquiries are still coming in, but not as heavy as a few months back. Equipment orders for large calibre shell production are now being placed and a number of plants are expected to be in operation in a short time. The demand for supplies is still very active.

Old Materials

Transactions in all kinds of scrap metals have been very active, and the situation is somewhat stronger than a week ago. Dealers report good business. An advance of 1 cent per pound is noted on all coppers, also on No. 1 machine compositions. Other metals are firm at last week's prices, except aluminum, which has dropped to 30 cents per pound, being a decline of 2 cents

Toronto, Ont., Jan. 11.—Industrial conditions have changed little during the past few weeks. Factories working on war orders are operating at about the same rate of production and indications point to about the same degree of activity for several months at least. Conditions are now more stable and orders are being placed on a more systematic basis than formerly. The outlook in industrial circles continues favorable and there is a general feeling of confidence in the future. Canadian manufacturers should however, bear in mind that the present period of prosperity will come to an end sooner or later, when it will be necessary to look to other markets for business. When conditions become normal again there will be increased opportunities for trade both in Canada and other countries. The British Board of Trade has already started a campaign for the purpose of capturing trade which formerly went to Germany. The time has arrived for a similar policy to be adopted in Canda.

There are no new developments with regard to shell orders and manufacturers are producing shells in satisfactory quantities. In the future, the placing of orders will apparently rest on financial considerations rather than technical. The system of credits already inaugurated by the Minister of Finance will probably have to be extended in order that Canadian manufacturers may get the large orders for shells which they are now capable of executing. All orders in future will be placed on a competitive basis as in the case of the large calibre shells for which preparations are now being made to manufacture.

There is a general tendency in both steel and metal markets for higher prices, the result is that finished products will also increase in cost. Indications point to higher prices for almost all finished products with no possibility of a reaction in sight. Steel and iron products, machine tools and machine shop supplies of all kinds have increased in cost and will no doubt go higher in the near future.

Steel Market

The greatest activity continues to prevail in the iron and steel trade and the mills are operating at capacity. The market has been steadier lately but higher prices are probable in the near future. Prices in the American market are rising steadily and a corresponding condition may be expected in Canada. Prices of galvanized sheets are very firm and the situation shows no improvement. All raw materials are increasing in cost and the output of sheets has decreased. There is a good demand for black and blue annealed sheets, the mills operating at capacity. No. 9 and 10 blue annealed are quoted at 2.25c and No. 28 black sheets 2.60c Pittsburgh.

The embargo on export shipments of iron and steel products is being maintained by the American railroads but there is a possibility of the situation being considerably relieved within the next two or three weeks. In the meantime domestic consumers are reaping the benefit by getting quicker deliveries. The situation has had no effect on prices which continue to advance steadily with a strong market. Steel bars are now quoted at 2c, iron bars 1.95c, and shapes 1.90c f.o.b. Pittsburgh. The demand for billets continues heavy and the market very firm with prices unchanged. The U. S. Steel Corporation report unfilled orders of 7,806,220 tons on Dec. 31st.

Pig Iron

The pig iron market is very strong and prices firm. The entire production of the furnaces is being consumed and there is a possibility of a shortage of pig iron in the near future. Grey Forge, Pittsburgh has advanced to $18.45. Hamilton and Victoria brands are unchanged at $23 per ton, but will advance shortly.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian.—Messrs. S. Ruperti and Alexsieff, care Military Attache, Russian Embassy, Washington, D.C.

Old Materials

The embargo on the export of wrought and steel scrap is still in force and local scrap dealers believe that it will not be lifted notwithstanding the protests from American interests. The market for wrought and steel scrap is weaker, the mills are now buying very heavily at the present time. The scrap copper market is fairly strong and prices are a little higher. The lead market is strong and prices of tea and heavy lead have advanced. Aluminum and No. 1 machine composition have both advanced but other prices are unchanged.

Machine Tools.

There is no change to note in the machine tool situation. Business during the past few weeks has been much quieter, although there have been a number of inquiries for heavy lathes. The market for second-hand tools is quieter.

Supplies

A number of important price changes have been made since the New Year. Malleable and cast iron fittings have been advanced for some lines, the new discounts being given in the selected market quotations. Makers of milling cutters have again raised their prices, and have withdrawn all quotations on high-speed cutters. Carbon cutters are higher, and are now quoted at the list plus 10 per cent. New prices have been issued for "Armstrong" tool-holders. Turning and boring tools are now quoted at list plus 20 per cent., and cutting off and side tools at list plus 40 per cent. Lathe chucks have been gradually increasing in cost for some time, and are now 20 to 25 per cent. higher. Drill chucks have not changed much, but are higher for certain lines in demand. The demand for supplies from plants making shells is not so active, but there is very fair business being done with shops turning out shell parts.

Linseed oil made a sharp advance during the week ,and is now quoted at 98c for raw and $1.01 for boiled oil. The flax seed situation is acute, and higher prices for oil are quite possible. Another advance in cotton waste is looked for in the near future, due to the increase in cost of raw materials. Putty has advanced 15c, and is now quoted at $2.95 per 100 lbs. in drums. Canadian crude oil is now quoted at $1.83 per barrel, representing an advance of 10c from the last quotations; higher prices for gasoline and benzine may, therefore, be expected. Cut leather lacing has advanced, and is now quoted at $1.30.

Metals

The general market is stronger, with a fair local demand, which is gradually improving. The copper market is very strong, and quotations have again advanced, but are nominal. The British Government is restricting purchases in America, and is apparently determined, if possible, to stop further advances, and absolutely to stop speculation. How this will affect the market is difficult to say, as the copper position is an extremely strong one, and the supply is unequal to the demand. Quotations on tin are higher locally, but have declined in the primary market. The situation is more or less abnormal, and prices of tin are nominal. The spelter market is

quiet, with little interest being shown by consumers. Quotations for spelter are higher in the local market. The "Trust" have advanced lead, and the market is strong and higher. Antimony and aluminum are unchanged, but prices of solders are higher.

Copper.—The copper market is very strong and higher. It is reported that the British Government is restricting purchases of copper, and is determined, if possible, to stop further advances. This step has also been taken with the hope that speculation will be stopped. The situation is unprecedented, and it is quite possible that prices may go higher, as the supply is unequal to the demand, and production is getting behind the consumption. Local prices are 2c higher, and lake copper is now quoted at 26c per pound.

Tin.—The primary market is slightly lower, but steadier. Locally tin has advanced 2c per pound. The tin situation is more or less abnormal, and buyers are keeping out of the market awaiting developments. Local prices are higher and nominal at 45c per pound.

Spelter.—The local market is stronger and higher. London is unchanged, and New York firmer on early deliveries. Spelter has advanced 1c, and is now quoted at 20c per pound.

Lead.—The market continues strong and higher in the primary market. The "Trust" have advanced the price to 5.90c at New York. The lead position is a strong one and the demand is heavy. Lead has advanced ½c, and is now quoted at 7½c per pound.

Antimony.—The market is quiet, with an easier tendency. Spot antimony is scarce, and there is little inquiry for futures. Quotations are unchanged at 40c per pound.

Aluminum.—The situation is unchanged, and the market featureless. Quotations are firm and unchanged at 68c per pound.

Solder.—Higher prices are now being quoted for solders, due to the strength in the tin market. Half-and-half has advanced 1c, and is quoted at 24½c per pound.

Foundry Supplies

The market for practically all foundry supplies and chemicals continues very firm, with a decided tendency to higher prices. Felt polishing wheels have advanced due to the scarcity of wool, while bullneck wheels are higher on account of the increase in the price of leather. Pumice is getting scarce, and higher prices are looked for. Emery in kegs and emery composition have advanced slightly, and the market is very firm. Higher prices are being quoted for copper anodes, and tin and zinc anodes are very firm. There is no improvement in the situation with regard to chemicals: prices continue high, and some lines are very difficult to obtain. Copper sulphate is very scarce, and prices have advanced to 15c per pound, while copper carbonate is quoted at 30c per pound. Sulphuric acid and carbolic acid are very scarce, and prices are more or less nominal.

Business in foundry and plating supplies is quiet. Foundries during last year were operating at considerably under capacity, and the demand for equipment and supplies has, therefore, been comparatively light. The prospects for this year cannot be said to be very bright, although considerable improvement is expected in the agricultural implement business on account of the very favorable conditions prevailing in the West. Platers are doing a fair business, considering the conditions prevailing. The substituting of nickeled cast iron nose plugs for shells instead of brass has been productive of considerable business, and the demand for the necessary equipment is increasing.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

Winnipeg, Man., Jan. 8.—As an indication of the way things are improving in Western Canada, the Manitoba Rolling Mills at Selkirk, Man., which have been completed for over a year, but have never been operated, will, it is understood, start up some time in March. They will employ about 100 men and will make merchant bars and bolts.

There is at present an exceptionally good demand for bar iron in the West, and prices are good. It was owing to the poor prices prevailing on the outbreak of war, that this mill did not commence operations on its completion. There seems to be a good demand for nuts and bolts all over the West, the bolt mill of the Alberta Rolling Mills, Medicine Hat, working full time, and sometimes overtime.

On the whole there is a decided improvement in the machinery outlook in Western Canada, enquiries coming in right along from country points for general lines of machinery and supplies, especially the latter. These are coming from machine shops, blacksmith shops, saw-mills and laundries.

The Manitogogan Mining Co., a gold mining concern who have opened up at Lake Winnipeg, have already placed orders for a large amount of machinery and equipment. Orders placed this week consisted of two 150 h.p. boilers, a Corliss engine, electric lighting plant and a large amount of mining machinery. These orders were placed with local houses. It is understood that this company has good financial backing.

Little is heard just now regarding further contracts for shells being let in Winnipeg. The impression seems to be gaining ground that with future contracts being let by tender, fewer orders will come this way, especially as the cost of transferring metal to and from the West must be exceedingly heavy.

There is a fair demand for machine shop equipment, but as few firms are able to offer delivery in less than four or six months, there is little business doing. It is understood that the Grand Trunk Pacific is in the market for five machines consisting of lathes and milling machines. Enquiries for woodworking machinery are coming in pretty freely.

TO OUST GERMAN MANUFACTURES

IN connection with a report on efforts of the British Board of Trade to capture German trade both during and after the war which has reached the Trade and Commerce Department from Commissioner Lithgow, of Glasgow, it is noted to what an extent Germany has been supplying the necessary tools for the staple industries of the different colonies of the British Empire. This is especially noticeable in the case of Canada," says the report, "which seems to get a large share of cutlery and forestry implements from German makers."

To assist British manufacturers to capture enemy trade the British Board of Trade has collected, and is exhibiting, samples of German and Austrian goods sold abroad. Of these samples the report states: "Small tools and light cutlery brought from Canada are exhibited at prices that British markets cannot at present compete with. It is no use for British manufacturers to point out that

their goods are of a more durable make. The German goods are attractive in finish, and justify their existence by the unanswerable argument that they sell in preference to British goods."

OUR EXPORT TRADE INCREASING

A DECREASE of $93,001,317 in imports and an increase of $91,283,933 in exports for the twelve months ended October is shown in a statement published by the Department of Trade and Commerce on Saturday last. These figures do not take into account the movement of gold, which shows a very heavy increase in the export column.

Imports for the twelve months totalled $421,584,000, of which goods to the value of $72,320 came from Great Britain, a drop of $32,700,000 in the imports of British goods. Imports from the United States amounted to $346,570,000, or $74,505,000 less than in the previous twelve months. Exports of merchandise totalled $550,548,000, including $41,455,829 of foreign produce. Exports to Great Britain amounted to $277,527,000, an increase of $73,000,000. To the United States, Canada sold goods to the value of $314,118,000, a rise of nearly $100,000,000. Imports from France dropped from $11,567,000 to $5,700,000, but exports to France increased from $8,940,000 to $27,620,000. To Belgium, Canada sent supplies of various kinds to the amount of nearly a million dollars.

The statement shows that $20,000,000 worth of hams and bacons, or about three times as much as in the previous year, went to Great Britain. It shows also that imports of tea amounted to $8,346,000, a 30 per cent. increase.

Exports of manufacturers rose to $130,350,000, an increase of $65,000,000.

EXPORTS PROHIBITED

AN ORDER in council prohibiting the export of scrap steel and scrap wrought iron and of oatmeal, rolled oats and hay has been passed by the Dominion Government. The prohibition of hay exports merely carries into effect the embargo recently announced which was placed on hay from Canada, except for the United Kingdom, British possessions and protectorates, France, Italy, Japan and Russia (except Baltic ports). The prohibition of the export of scrap steel applies to all destinations abroad other than the United Kingdom, British possessions and protectorates. The prohibition of rolled oats and oatmeal export is to all foreign ports in Europe and on the Mediterranean and Black seas, other than those of France, Russia (except Baltic ports), Italy, Belgium, Spain and Portugal.

CANADIAN COMMERCIAL INTELLIGENCE SERVICE

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

Argentine Republic.
H. R. Poussette, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

Australasia.
D. H. Ross, Stock Exchange Building, Melbourne, Cable address, Canadian.

British West Indies.
E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

China.
J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

Cuba.
Acting Trade Commissioner, Lonja del Comercio, Apartado 1290, Havana. Cable address, Cantracom.

France.
Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

Japan.
G. B. Johnson, P.O. Box 109, Yokohama. Cable address, Canadian.

Holland.
Acting Trade Commissioner Zuidblaak, 26, Rotterdam. Cable address, Watermill.

Newfoundland.
W. B. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

New Zealand.
W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

South Africa.
W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

United Kingdom.
J. E. Ray, Central House, Birmingham. Cable address, Canadian.
Acting Trade Commissioner, North British Building, East Parade, Leeds. Cable address, Canadian.
F. A. C. Bickerdike, Canada Chambers, 36 Spring Gardens, Manchester. Cable address, Cantracom.
J. Forsythe Smith, Fruit Trade Commissioner, Canada Chambers, 36 Spring Gardens, Manchester.
J. T. Lithgow, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.
Harrison Watson, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London.

SPECIAL TRADE COMMISSIONER—LUMBER.

H. R. McMillan, visiting Europe, Africa, Australasia and the Orient.

CANADIAN COMMERCIAL AGENTS.

British West Indies.
Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian.
R. H. Curry, Nassau, Bahamas.

Norway and Denmark.
C. E. Sontum, Grubbeged No. 4, Christiana, Norway. Cable address, Sontums.

South Africa.
D. M. McKibbin, Room 34, Permanent Buildings, Harrison Street, Johannesburg.
E. J. Wilkinson, Durban, P.O. Box 673, Durban, Natal.

CANADIAN HIGH COMMISSIONER'S OFFICE.

United Kingdom.
W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Weedon, Que.—The Weedon Chemical Co.'s factory has been destroyed by fire.

Sherbrooke, Que.—The Canadian Ingersoll Rand Co. are building a new machine shop.

Hespeler, Ont.—The A. E. Jardine Co. has completed the addition to the plant, and is installing new machinery.

Redcliff, Alta.—The Redcliff Rolling Mills will be extended, and machinery for making bolts and nuts installed.

Medicine Hat, Alta.—The Lake of the Woods Milling Co. propose installing new equipment in the power plant at the mill here.

Hamilton, Ont.—The Hammant Steel Car Co. are considering the erection of an addition to their factory. Manager, J. Marsella.

Regina, Sask.—The Imperial Oil Co. have decided to make this city a distributing point for the West. A refinery will be built here.

Electrical

Wyoming, Ont.—The installation of an electric light system is contemplated to cost about $6,000.

Palmerston, Ont.—A hydro-electric system will be installed at an approximate cost of $12,000.

Merrickville, Ont.—Work will proceed shortly on the installation of the proposed street lighting system.

Wyoming, Ont.—The ratepayers on January 7 voted in favor of installing hydro-electric power by a vote of 101 to 11. The proposal voted upon was for an expenditure of $5,500 on station and plant. Work will be commenced at once.

Welland, Ont.—The Welland Hydro-Electric Commission have received a request for more power from the Canada Forge Co. and the new zinc smelter. It is estimated that between 2,000 and 3,000 h.p. will be required, and the installation will cost about $30,000.

Municipal

Merrickville, Ont.—The by-law was carried to provide for an electric street lighting system.

Hamilton, Ont.—The erection of a municipal abattoir is contemplated by the City Council.

Cochrane, Ont.—The Town Council has passed a by-law to provide $5,500 for waterworks improvements.

Owen Sound, Ont.—The by-law to authorize a loan of $12,000 to the Owen Sound Shoe Mfg. Co. was carried.

North Vancouver, B.C.—The construction of a new pumping station is contemplated. Plans are being prepared.

Hepworth, Ont.—The by-law to authorize a loan of $12,000 to the Hepworth Pressed Brick Co. was carried on Jan. 3.

Point Grey, B.C.—The City Council are considering the purchase of a motor-driven combination chemical and hose wagon.

Stayner, Ont.—A by-law will be submitted authorizing an expenditure of $5,000 to extend and improve the hydro-electric plant and waterworks.

Calgary, Alta.—Plans have been prepared by the city engineer, G. W. Craig, for the construction of a waterworks system, estimated to cost $3,000,000.

Petrolea, Ont.—At a special meeting of the Town Council held recently a by-law was passed to provide money for current expenditures in connection with the installation of hydro-electric system.

New Toronto, Ont.—The by-law granting the Goodyear Tire & Rubber Co. a fixed assessment carried here on Jan. 8, by a vote of 189 for and 58 against. The company propose spending $500,000 on the new plant.

EQUIPMENT REQUIRED FOR AUSTRALIAN RAILWAY

Specifications and blue prints of drawings have been received from D. H. Ross, Trade Commissioner, Melbourne, for equipment required by the Victorian Railways. These tender forms are open to the inspection of interested Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer File No. A-1435). Particulars of the requirements, together with the date on which the tenders close at Melbourne are briefly outlined thus:—

No. 29,671. February 23, 1916—2 air pressure blowers and accessories.

No. 29,672. February 23, 1916—1 air pressure blower and accessories.

No. 29,673. March 15, 1916—1 high-speed single spindle sensitive drill with table vise, tools, gears and accessories.

The departure of mails from Vancouver and San Francisco are indicated thus:—

From Vancouver, January 19, due Melbourne on February 12, 1916.

From San Francisco, February 15, due Melbourne on March 7, 1916.

From Vancouver, February 16, due Melbourne on March 10, 1916.

General Industrial

Peterborough, Ont. — The Auburn Woollen Mills will be enlarged.

London, Ont.—The Parnell Baking Co. propose enlarging their plant.

Ottawa, Ont.—The Capital Wire Cloth Co. will build an extension to their factory.

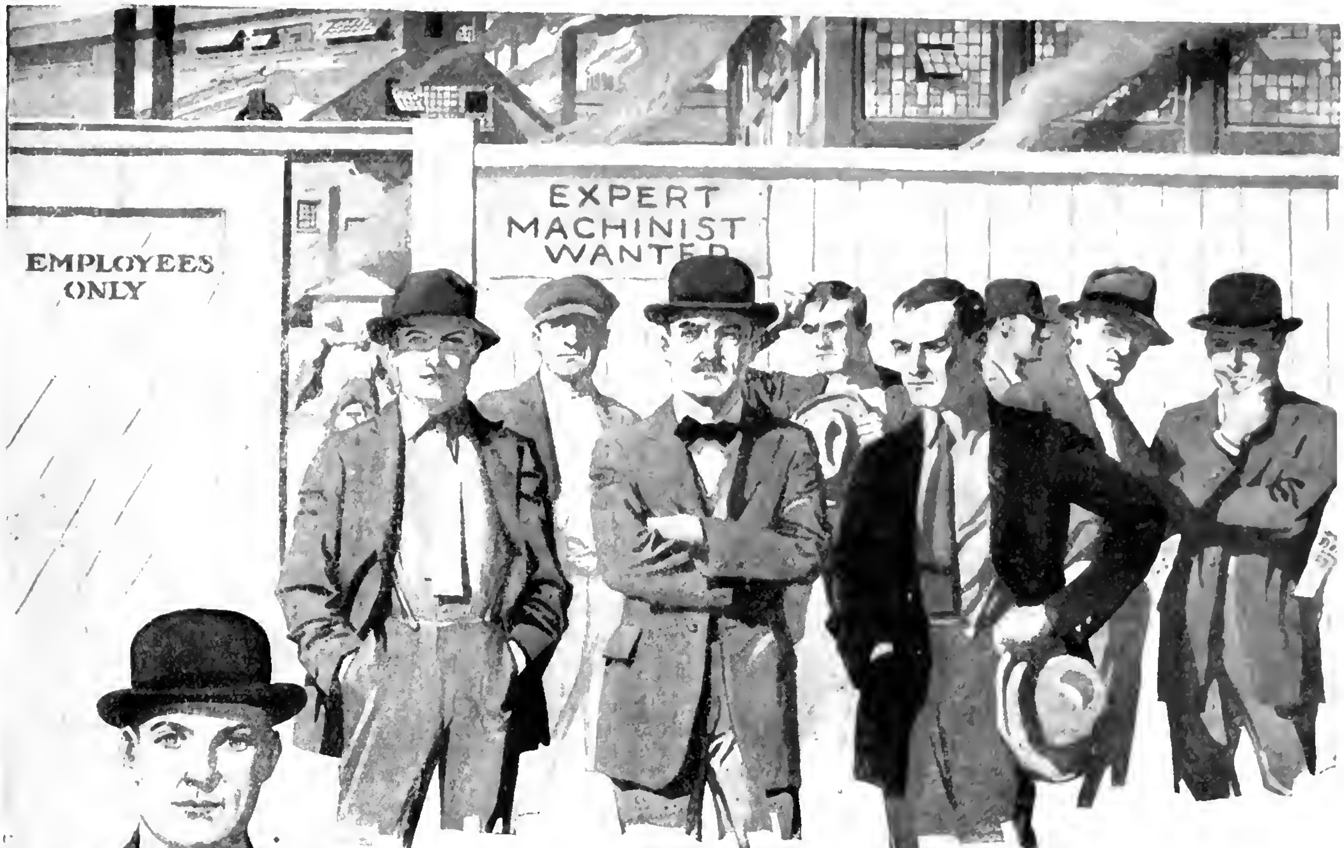
Pembroke, Ont.—It is reported that the Hardware Specialties, Ltd., will erect a factory here.

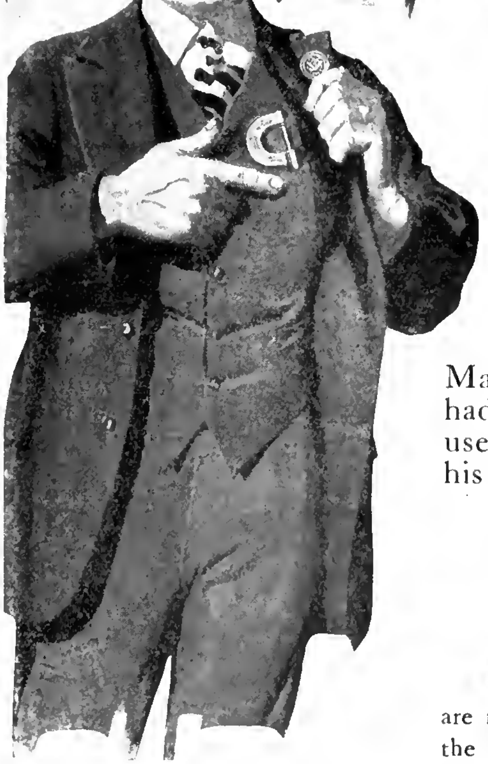
Toronto, Ont.—The Canada Metal Co. will build another extension to their plant, to cost about $10,000.

Kingston, Ont.—The Reliance Moulding Co. has been taken over by W. C. Phillips, of Toronto, and will in future be known as the Frontenac Moulding & Glass Co.

Quebec, Que.—The building of the Rock Shoe Manufacturing Co. was destroyed by fire on January 2. The loss is estimated at $75,000, while the insurance amounts to only $35,000.

Hamilton, Ont.—The Perkins Glue Co., of Lansdale, Pa., have leased the factory formerly occupied by the Climax Road Machinery Co., and will make extensive alterations to suit the requirements of their industry. The company make a special kind of vegetable glue, which is used extensively for veneering purposes.





This is the Man Who Got the Job

THOSE whose duty it is to hire machinists vouch for the old saying—"A workman is known by his tools."

Many a man has been given a job at fine work because he had in his kit tools of great accuracy. No expert artisan uses anything but tools of precision. The best workman does his best work only with perfect tools. And remember this—

Uniformity of measuring instruments throughout your shop means uniformity of accuracy in your product.

Starrett Tools

are recognized by engineers, manufacturers and skilled workmen throughout the world as a standard of accuracy. Starrett Tools include 2,100 styles and sizes of instruments—steel rules, tapes, squares, hack saws, calipers and dividers, micrometers, and many others. We deal direct with hardware stores.

Send for Free Catalogue No. 20-3, Prices and Terms.

THE L. S. STARRETT COMPANY, ATHOL, MASS.

"The World's Greatest Tool Makers"

NEW YORK **LONDON** **CHICAGO**

Trade Gossip

Wool Exporting Stopped—Acting under Imperial instructions, the Government of New Zealand has prohibited the export of wool to neutral countries.

The Canadian Link Belt Co., Toronto, have been awarded a contract for a coal and ash handling plant for the Dominion Government's dry docks at Quebec.

The Turbine Equipment Co., Toronto, have received an order for a 75 h.p. motor-driven De Laval two-stage centrifugal pump from the Riordan Pulp & Paper Co.

The Canadian Steel Foundries, Ltd., of Montreal, has added one 30-ton acid open-hearth furnace at its Longue Pointe Works, and is preparing to erect others in the very near future.

The Dominion Coal Co., Sydney, N.S., have purchased two 75 h.p. direct-current motor-driven De Laval two-stage centrifugal pumps from the Turbine Equipment Co., Toronto, Ont.

U.S. Steel Tonnage—The United States Steel Corporation on Jan. 10 reported unfilled orders on its books December 31 of 7,806,220 tons, as compared with 7,189,487 on November 30 and 3,836,643 on December 31, 1914.

The Canada Cycle & Motor Co., Ltd., will henceforth be conducted as an organization separate from the Russell Motor Car Co. Lloyd Harris will be president, and J. W. Gibson will be general manager. The company will continue to manufacture bicycles, skates, and accessories.

Platinum in Ontario.—An important platinum find is reported in Northern Ontario, in Munro Township, ten miles east of Matheson. It is stated that assays, of which five were made, run $180 to $1,800 a ton. Within a week it is believed development work will be carried on to determine the extent of the ore.

Winnipeg, Man.—The Munro Steel and Wire Works, Ltd., have moved their complete plant to the Elmwood district, and have amalgamated with the Hero Manufacturing Co,. Ltd., and the combined concerns have increased their capital to $100,000, to enable them to meet the ever-increasing demand for their products.

Regulating Copper Trade—With a view to fixing the price of copper and preventing speculation in the metal on the London market, the Ministry of Munitions has notified consumers in Great Britain that they must not purchase more than fifty tons of copper in one lot and must not pay more than £100 per ton for refined copper.

C.P.R. Places Embargo on Grain to Lakes—The C.P.R. has placed an embargo for one week against the loading of grain for Fort William and Port Arthur, Ont. This is occasioned by the large number of loaded cars in transit for these terminals. It is hoped by the officials that at the end of the week it will be possible to remove the embargo.

The Toronto Board of Trade have elected the following officers by acclamation: President, Arthur Hewitt; vice-presidents, Messrs. John G. Kent and C. A. Bogert; treasurer, Charles Marriott; Board of Arbitration, Messrs. John Carrick, Thomas Flynn, F. W. Hay, F. G. Jarvis, J. T. Mathews, W. D. Matthews, D. Plewes, Douglas Ponton, J. B. Reid, F. J. Smith, W. M. Stark, F. W. Tanner.

The Turbine Equipment Co., Toronto, have received an order from the Brockville Water & Light Commission for one 4-million gallon De Laval steam turbine connected to a De Laval centrifugal pump through the medium of double helical reduction gears; also one 3½-million gallon and one 2-million gallon De Laval motor-driven pump. One C. H. Wheeler jet condenser will also be installed.

Sherbrooke, Que., Building.—During 1915 forty-three building permits were issued, the total value amounting to $350,000. The outlook for the present year is, we are informed, very encouraging, erection of buildings to the value of $250,000 being already contemplated; this, with the amount of construction work usually done during the year, promise to give ample employment to all classes of labor.

Shipmasters' Association.—The International Association will hold its annual convention in Toronto in the last week of the present month. Upwards of 100 delegates from outside points will be in attendance, representing some 1,500 members. This is the first time the convention has been held in Canada. The matters to be discussed relate to methods for improving navigation on the Great Lakes and ocean coast, lights, storm signals, etc

Britain's Foreign Trade—The British Board of Trade figures for December show an increase of £3,621,000 in imports and of £7,668,000 in exports. The principal increases in imports were in grain, flour and metals. Dutiable imports of food, drink and tobacco decreased by £4,000,000. The increase in exports was principally in cotton, iron and manufactured steel. For the year 1915, imports increased £157,121,000. Exports decreased £46,076,000.

1916 Hydro-Rates.—The new schedules of rates issued by the Ontario Hydro Electric Commission show that reductions have been recommended for nearly sixty municipalities in the Niagara zone. The recommendations governing domestic and commercial consumption mean an average reduction to the consumer of about ten per cent. These vary considerably, in some places the cut running as low as three per cent., and in others running as high as twenty per cent. Power rates are also generally reduced.

Machine Gun Contract—The British Government, through J. P. Morgan & Co., has just awarded a contract for the manufacture of 10,000 newly patented Lewis light automatic field machine guns with the Savage Arms Company, of Utica, N.Y. The price is $750 each, making the total value of the order $7,500,000. The guns are to be delivered in graduated lots, running up to a maximum of 50 per day. The bankers for the British Government will advance the company $1,875,000 to enable the work to proceed immediately.

Dominion Steel Corporation.—The wide difference in the business of the Dominion Steel Corporation in December of 1914 and last month is shown in the following comparison of the output, in tons, of the several departments of the corporation's plant:

	1915.	1914.
Pig iron	34,768	12,598
Steel ingots	35,767	19,699
Rails	.....	3,349
Wire rods	9,685	3,763
Wire and wire products	5,564	3,836
Coal	436,239	317,117

Nova Scotia Coal for Warships.—For some time past, Nova Scotia has been anxious to obtain an Admiralty test of washed nut coal obtainable in the province. Sir George Perley and Agent-General Howard, who approached the authorities in London, have received an intimation that a telegram has been sent to the Commander-in-Chief of the West Indies Station, instructing him to arrange for the earliest possible test of this coal on Admiralty vessels, and also to consider the possibility of making a similar test on warships on the same station. A quantity of the coal is also to be sent to Portsmouth for testing.

Output at Cobalt Camp.—Ore tonnage from the Cobalt and Kerr Lake silver camps last week showed a decided increase on previous weeks. Twelve cars in all were shipped, of which three were from Kerr Lake, one from the Beaver Mine and two from Timiskaming.

Nipissing and Coniagas each shipped two cars, while a car was sent from each of the following: Penn. Canadian, Buffalo. Peterson Lake, Dominion Reduction and Mining Corporation. The total tonnage was 832,226 pounds. A car of

How to Get the Accurate Cost

is a vital consideration with you, for by this and this only are you able to figure out whether you are actually making a profit or not, each month. No reason why you shouldn't have it during 1916.

The Mechanical Cost Keeper, illustrated, does at least two very important things:

1—It shows the exact amount of productive labor you are able to charge up against any given job.

2—It shows exactly the amount of "non-productive" labor you are paying for but are not able to charge against any job.

When the Mechanical Cost Keeper is used no workman or foreman can force a balance between his productive and his non-productive time. The machine is cold-blooded, accurate and mechanically correct. The Mechanical Cost Keeper throws a searchlight on a very important part of your overhead expenses—that is, the non-productive labor in your plant.

We are the largest makers of Time Recording and Cost Keeping Machinery in the World and shall be glad to send you particulars or advice as to time recording or cost keeping system best suited for your business.

OUR GUARANTEE: We offer $100 reward to anyone who will buy a new International Time or Cost Recorder from the Company or an authorized agent at under list price, less our regular discount.

INTERNATIONAL TIME RECORDING COMPANY OF CANADA, LIMITED

F. E. MUTTON
Manager

Ryrie Bldg., Cor. Shuter and Yonge
TORONTO

MONTREAL
Cartier Bldg.

The Comments of Geometric Customers Are Worth Framing

A Few Are Here

These extracts are not concocted in our Advertising Department, but are from letters on file in our Office.

HANG THIS UP

"That you have the best Die Head that ever cut a thread, has been our opinion for fifteen years."

"Geometric Die Heads have become indispensable to our work."

"Have used Geometric Dies for some time and have also used other makes, but find they do not give the standard of excellence which yours do."

"Your Die Heads are doing most satisfactory work for us."

"We have never been able to get such efficient results from any other Die Head."

THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U.S.A.

Canadian Agents: WILLIAMS & WILSON, Limited, Montreal.
The A. R. WILLIAMS MACHINERY CO., Limited
Toronto, Winnipeg, St. John, N.B.

copper ore was shipped by the Rond Syndicate, of Latchford.

Lethbridge, Alta., Building.—The year 1915 has been unusually quiet as far as building operations were concerned. There has been a surplus of accommodation both as to residences and business premises throughout the year, and consequently no incentive to do further construction work. Business has improved considerably during the last three months, as indicated by bank clearings and in a number of other ways. The coal mines are all working to capacity, and there are now fewer vacant houses in the city than at any time during the past eighteen months. In view of this it is possible there will be a revival in the spring, although it is not anticipated that a great amount of building will be the rule in Western cities during 1916. The building permits issued in 1915 amounted to $58,420, while those in 1914 amounted to $341,770.

Personal

J. W. Gibson has been appointed general manager of the Canada Cycle & Motor Co., Ltd., Toronto.

W. D. Reid, president of the Reid-Newfoundland Co., has had the honor of knighthood conferred upon him.

Robert Archer, a prominent business man in Montreal and a director of the Northern Electric Co., died on January 7, aged 79.

Paul J. Myler, general manager of Canadian Westinghouse at Hamilton, Ont., has been elected a director of the Bank of Toronto.

F. W. Sumner, of Moncton, N.B., has been elected president of the St. John and Quebec Railway Co., in succession to Irving R. Todd, of St. Stephen, recently resigned.

Frank E. Watkins, formerly associated with the Canadian Fairbanks-Morse Co., Toronto, has been appointed works manager of the East Jersey Pipe Corporation, Paterson, N.J.

T. A. Russell has retired from the Canada Cycle and Motor Co., Toronto, to become vice-president of the Willys-Overland Co. of Canada, Ltd., who have taken over the Russell Motor Car Co.'s automobile business.

Sherman Rogers, K.C., has been appointed a director of Nova Scotia Steel & Coal Co., to fill the vacancy caused by the retirement of Mr. Justice Harris. Mr. Rogers was also last week elected a director of Acadia Sugar Refineries.

Richard Grigg, Canadian Commissioner of Commerce, died suddenly at Ottawa on January 6th. The deceased was born at Plymouth, England, in 1847, and came over to Canada at an early age, returning to England a few years later. After a successful business career in England, Mr. Grigg retired in 1905 to accept a commission from the British Government to investigate and report on economic conditions in Canada. He was appointed Trade Commissioner for Canada in 1909, with headquarters at Montreal, and in 1912 was appointed Commissioner of Commerce. His position had the rank of Deputy Minister under the Minister of Trade and Commerce.

New Incorporations

The Frontenac Moulding Co. has been incorporated at Ottawa, with a capital of $250,000, to carry on a wood-working business at Kingston, Ont. Incorporators: John M. Duff and Kenneth D. McKenzie, of Toronto, Ont.

Wm. Wrigley Jr. Co. Ltd., has been incorporated at Ottawa, with a capital of $2,000,000, to manufacture chewing gum, etc., at Toronto. Incorporators: W. A. J. Case, J. B. Taylor, and G. C. Loveys, all of Toronto.

British Munitions Co., Ltd., has been incorporated at Ottawa, with a capital of $50,000, to manufacture time fuses and other parts of shells. The head office is at Montreal, and the incorporators are F. G. Bush, G. R. Drennan, and H. W. Jackson, all of Montreal.

The Canada Nitro Products, Ltd., has been incorporated at Ottawa, with a capital of $5,000,000, to manufacture munitions and explosives. The head office is at Toronto, and the incorporators are Edmund Hale Austin and Charles Evans-Lewis, of Toronto.

Railways—Bridges

Winnipeg, Man.—Plans are being drawn for a new bridge over the Winnipeg River, which will cost about $30,000.

Calgary, Alta.—The Commissioners will prepare an estimate covering the completion of the Centre Street Bridge.

Moncton, N.B.—The directors of the St. John and Quebec Railway Co. have received four tenders for the completion of the line, but no award has been made.

Wood-Working

Jamestown, Ont. — The Jamestown Tables Co.'s factory has been destroyed by fire. The loss is estimated at $2,000.

Marine

Toronto Harbour Works. The Toronto Board of Harbour Commissioners on Jan. 5, passed their estimates for the year. They will spend in 1916 $2,500,000. The estimates last year amounted to $2,100,000, of which there was spent $1,200,000. Of the estimates this year the sum of $650,000 is for reclamation work, $100,000 for the proposed lift bridge over the Don at Cherry street, and the remainder for different construction work. The work of the commission will depend somewhat on the speed with which the reconstruction of the defective Government work is carried out. A start on this was made in the fall, and it will proceed in earnest in the spring. The commission has to fill in behind the cribwork.

Tenders

Windsor, Ont.—Tenders will be received until January 31 for heating, ventilating and sheet metal work for the new Windsor Collegiate Institute. Particulars may be obtained from the architect, J. C. Pennington, Windsor, Ont.

Toronto, Ont.—Tenders will be received by the Chairman, Board of Control, City Hall, Toronto, up to Tuesday, February 1st, 1916, for the supply and delivery of a number of street cars complete, bodies, trucks, motor equipment, air-brake equipment, copper cables for street car work, and fare boxes. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Catalogues

Flexible Grinder.—The Stow Mfg. Co., Binghampton, N.Y., have issued a bulletin No. 33 illustrating and describing the "Stow" Flexible Grinder built for the steel industry and allied trades.

The Morton Mfg. Co., Muskegon Heights, Mich., have issued an illustrated index of draw-out machine tools. The various types of machines are illustrated accompanied by a brief description while tables are included giving sizes of machine keys without heads and with gip heads. The reader is referred to other bulletins for more complete information covering the line of machine tools.

Sand Blast Barrels—Model A. "New Haven" self contained sand-blast barrel is the subject of a bulletin issued by the New Haven Sand Blast Co., New Haven, Conn. The construction and principal features of this sand-blast barrel and method of operation are described

in detail. The illustrations show exterior and interior views and also construction of details.

Steam Traps.—The George W. Cole Co., Toronto, Ont., have issued a new booklet illustrating and describing their line of boiler feed, return feed, lifting and vacuum traps. The illustrations include a diagram of a double trap installation. A table shows fuel losses when using steam pumps instead of return traps while other items include a price list, particulars of the "Cole" oil separator and a list of users of the "Cole" trap. Copies of this booklet may be had on application.

Electric Grinders.—The Standard Electric Tool Co., Cincinnati, Ohio, have issued a bulletin G9 to supersede G8, which deals with their "Standard" high power portable electric grinders fitted with ball bearings. These grinders are designed for various classes of work, and a general specification covers the principal features of this construction. Each type is illustrated and described briefly while the more important particulars as regards capacity, dimensions and current are also included.

Stop and Check Valves.—The Lunkenheimer Company, Cincinnati, Ohio, have issued a bulletin dealing with their non-return safety boiler stop valves, screw down check valves and regulating check valves. Each type of valve is fully described, and the service for which it is best suited stated. The illustrations show the principal constructional features and tables give the price for each size of the different combinations to suit various conditions of pressure, superheat and engineers' specifications.

The Rock Island Mfg. Co., Rock Island, Ill., have issued catalogue "T" dealing with an interesting and extensive line of hardware. The catalogue which is gotten up in an attractive manner is fully illustrated and describes many different lines including sad irons, grinders of various types, cement workers tools, carpenter's tools, grist mills, combination forge, anvil and vise equipments, etc. The various lines are briefly described and in many cases the principal dimensions and prices are included.

Air Compressors.—The "Zin-Ho" portable and semi-portable air compressors made by the Zin-Ho Mfg. Co., Chicago, Ill., are described and illustrated in bulletin No. B5. The portable outfits are first dealt with, the description covering the principal features and a table gives the general dimensions etc. The semi-portable outfits include air compressors, electric lighting plants and pumping outfits, each type being illustrated and briefly described. The "Zin-Ho" portable crane for shops and shipping rooms is also illustrated and described.

Fusion or Autogenous Welding is the title of a bulletin issued by the Prest-O-Lite Co., Inc., Toronto, Ont., for the purpose of dealing with the advantages of using Prest-O-Lite gas for oxy-acetylene welding. Various methods of welding are described in a general manner, considerable space given to the oxy-acetylene process. The "Prest-O-Lite" method is described at length, and its principal features dealt with in detail. Both high and low pressure systems are described as are also the economical features of the system.

Indicators.—James L. Robertson & Sons, Inc., New York, have issued a catalogue dealing mainly with the improved Robertson-Thompson steam engine indicator. The indicator is fully described special reference being made to the more important features of design while the illustrations show these features in detail. Directions for using are included together with a table of springs. The catalogue also contains full particulars covering various indicator attachments and planimeters etc., with instructions for using apparatus which is fully illustrated. The concluding pages are devoted to a description of the "Hine"

steam indicator and various lines of "Eureka" packings.

Psychrometric Tables for Cooling Tower Work published by the Wheeler Condenser & Engineering Co., Cartaret, N.J. This is a companion book to "Steam Tables for Condenser Work" and consists of a handbook of tables giving dry and wet bulb thermometer readings, dew point, humidity and the pounds of water vapor per thousand cubic feet and per hundred pounds of air, together with a discussion of Phsychrometry and the use of the sling psychrometer. The tables were read from an alignment chart specially prepared for the company.

B. C. TIMBER OUTPUT

ACCORDING to the timber returns for the month of September issued by the Minister of Lands, the total output of sawlogs for the Province of British Columbia, as shown by the sealing figures, amounted to 92,080,493 feet board measure, while 361,911 lineal feet of poles, piles and props, together with 29,312 cords of railway ties, fence posts, shingle bolts, etc., were also scaled for royalty during the month under review.

The figures for the Vancouver district were 53,001,924 feet board measure sawlogs, 14,394 lineal feet piles, etc., and 16,264 cords, ties, bolts, etc., the Island district contributing 5,307,218 feet sawlogs, in addition to 2,520 lineal feet piles. In the Prince Rupert district there were scaled 954,135 feet sawlogs, while the totals under the same heading for the Cranbrook, Nelson and Vernon districts were respectively 21,595,575 feet, 7,135,290 feet, and 3,349,603 feet. Poles, piles and props to the total of 328,304 lineal feet were scaled in the Nelson district, and in the Cranbrook division to the total of 15,013 lineal feet. Timber sales recorded during September cover an estimated total of 7,338,000 feet sawlogs, and 3,030 cords of shingle bolts, estimated to produce a total revenue of $12,876

The Germans are preparing to recapture some of their lost trade after the war. Already various articles of utility are being manufactured for men who have lost one or more limbs. The cables tell of Berlin catalogues containing distinct sections of table articles for one-armed men. Already there are indications that when peace is declared there will be a keener competition than ever in the world's business circles.

The propeller efficiency of aeroplanes in practice is about 60 per cent.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV, TORONTO, JANUARY 20, 1916 No. 3

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President — H. T. HUNTER, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY

PETER BAIN, M. E., Editor.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

B. G. NEWTON - - - - - - Advertising Manager

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—London, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 140 So. Dearborn St., Room 607, Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

steam indicator and various lines of "Eureka" packings.

Psychrometric Tables for Cooling Tower Work published by the Wheeler Condenser & Engineering Co., Cartaret, N.J. This is a companion book to "Steam Tables for Condenser Work" and consists of a handbook of tables giving dry and wet bulb thermometer readings, dew point, humidity and the pounds of water vapor per thousand cubic feet and per hundred pounds of air, together with a discussion of Phsychrometry and the use of the sling psychrometer. The tables were read from an alignment chart specially prepared for the company.

B. C. TIMBER OUTPUT

ACCORDING to the timber returns for the month of September issued by the Minister of Lands, the total output of sawlogs for the Province of British Columbia, as shown by the scaling figures, amounted to 92,080,493 feet board measure, while 361,911 lineal feet of poles, piles and props, together with 29,312 cords of railway ties, fence posts, shingle bolts, etc., were also scaled for royalty during the month under review.

The figures for the Vancouver district were 53,001,924 feet board measure sawlogs, 14,394 lineal feet piles, etc., and 16,264 cords, ties, bolts, etc., the Island district contributing 5,307,218 feet sawlogs, in addition to 2,520 lineal feet piles. In the Prince Rupert district there were sealed 954,135 feet sawlogs, while the totals under the same heading for the Cranbrook, Nelson and Vernon districts were respectively 21,595,575 feet, 7,135,290 feet, and 3,349,603 feet. Poles, piles and props to the total of 328,304 lineal feet were sealed in the Nelson district, and in the Cranbrook division to the total of 15,013 lineal feet. Timber sales recorded during September cover an estimated total of 7,338,000 feet sawlogs, and 3,030 cords of shingle bolts, estimated to produce a total revenue of $12,876

The Germans are preparing to recapture some of their lost trade after the war. Already various articles of utility are being manufactured for men who have lost one or more limbs. The cables tell of Berlin catalogues containing distinct sections of table articles for one-armed men. Already there are indications that when peace is declared there will be a keener competition than ever in the world's business circles.

The propeller efficiency of aeroplanes in practice is about 60 per cent.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV, TORONTO, JANUARY 20, 1916 No. 3

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President H. T. HUNTER, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY

PETER BAIN, M. E., Editor.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

B. G. NEWTON - - - - - - Advertising Manager

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—London, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 140 So. Dearborn St., Room 607, Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Making an Eight Ton Kettle Casting in a Dry Sand Mould

Staff Article

The use of dry sand for moulding a casting of the size and type described is somewhat unusual. The method of production for this special job had to be arranged to suit the existing equipment and while shops with ample fac lities would adopt different methods, the plant in question produced a large number of these special castings with almost negligible loss.

WHEN preparationis were being made for the production of a number of cast iron pots or stills as shown in drawing Fig. 1, careful consideration had to be given to the manner in which the moulding would be done. The size and nature of the casting was quite a departure from the regular line of work turned out, which, while of considerable dimensions, did not present such problems in coring, venting, and pouring. It was decided to mould the job upside down as this would allow the weight of the core to be supported on solid ground, the use of chaplets in any shape or form being strictly forbidden, and by no other method of moulding was it possible to comply with this restriction.

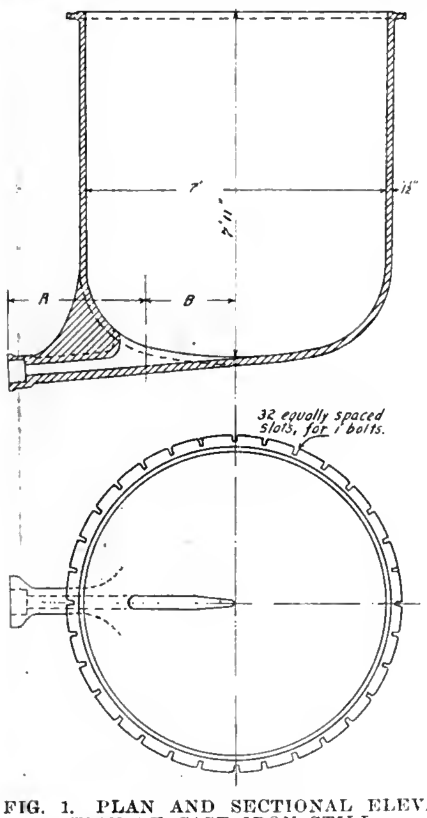


FIG. 1. PLAN AND SECTIONAL ELEVATION OF CAST IRON STILL.

Further discussion resulted in the making of a built-up core with a separate top or cap as the existing core oven was not large enough to accommodate a one-piece core of the required size. By sinking the whole job in the ground, the need of special flasks was overcome, while the pouring of the metal was done at floor level.

The first step in the work was to excavate a hole about fifteen feet square and ten feet deep which was carefully levelled up and packed solid to support the foundation plate, see Fig. 2. A number of tie rods are anchored to this plate, their upper ends being made with an eye into which are hooked other bolts carried up to the top of the mould.

Constructing the Core

The centre of the foundation plate has an opening provided with a grating to support the coke which forms the centre

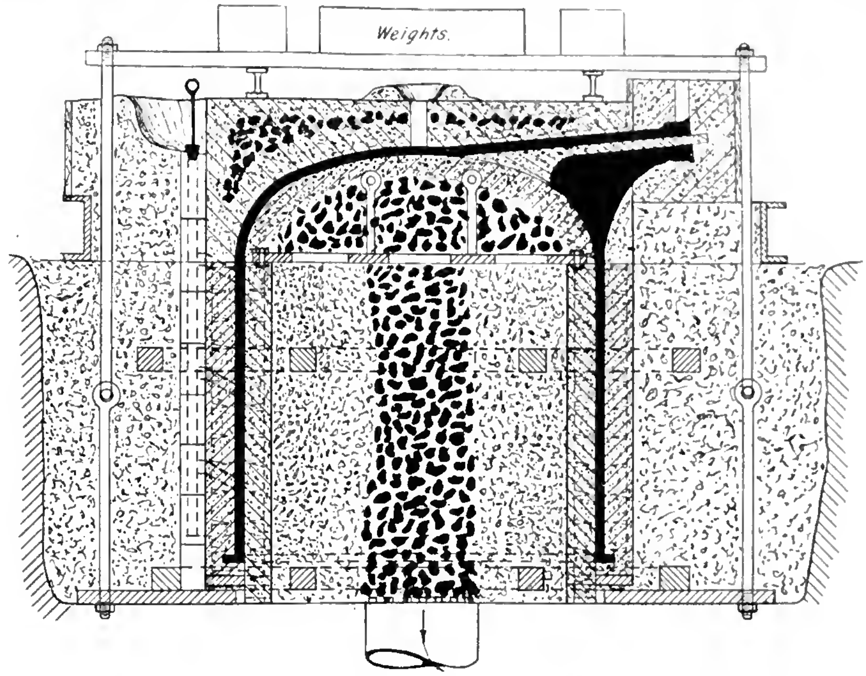


FIG. 2. SECTIONAL ELEVATION OF COMPLETE MOULD.

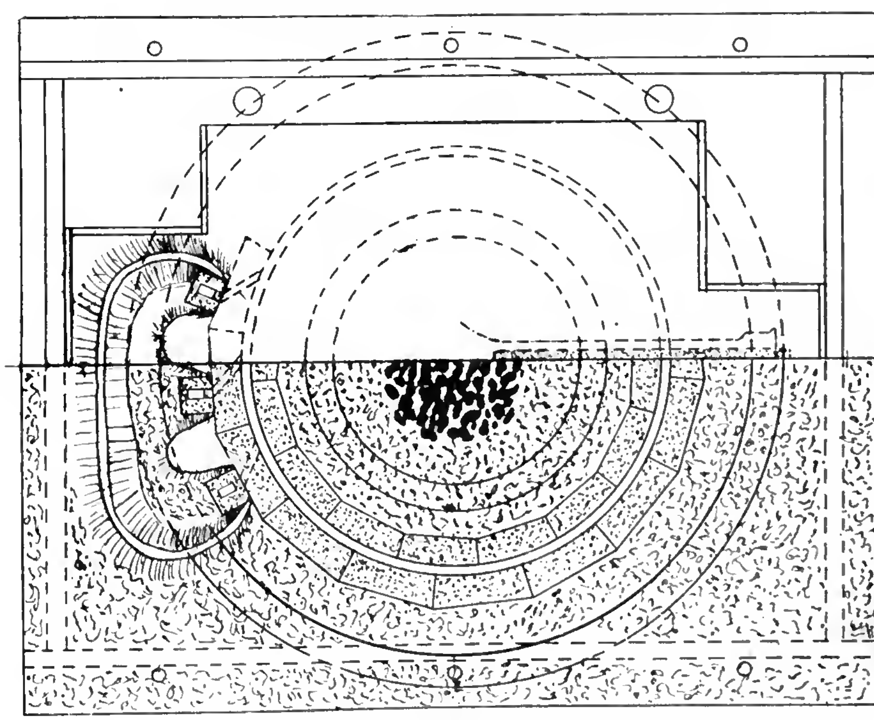


FIG. 3. HALF SECTIONAL PLAN OF MOULD.

of the core, and allows the venting of the gases to take place through a passage below the foundation plate. This passage was found useful as a means of draining off water which made its appearance for a few days after the hole

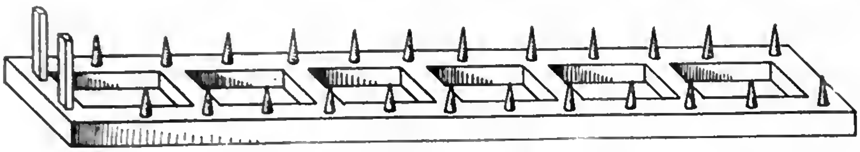


FIG. 4. IRON CORE FRAME FOR SEGMENTS.

was completed. After being covered with a layer of dry sand, the construction of the core is proceeded with.

The straight body of the core is formed of 16 segments shown in plan view of mould, Fig. 3. These segments are made of dry sand, formed on iron frames and baked. One of these frames is shown in sketch Fig. 4, two short bars being cast in position at the lower end. These bars project outward from the bottom of the core, and anchor it in position.

In building up the main core, the segments are assembled in position and bolted back to rings which pull the joints tightly together. The centre of the core is now filled up with coke, a suitable backing of green sand being placed between the dry sand segments and the coke centre. When filled the upper surface is carefully levelled and faced on the top of the segments to make a tight joint with the cap, which is now placed in position.

The cap is a dry sand core with a coke centre, and is made up on a circular frame which allows the gases easy access to the main vent. The frame is bolted to the top of the segments by eight bolts, access to the holes being had by cutting away sufficient material, the holes being afterwards filled up with green sand. The cap is lifted by three eyebolts fixed to the frame, the space around them being filled with dry sand plugs after the

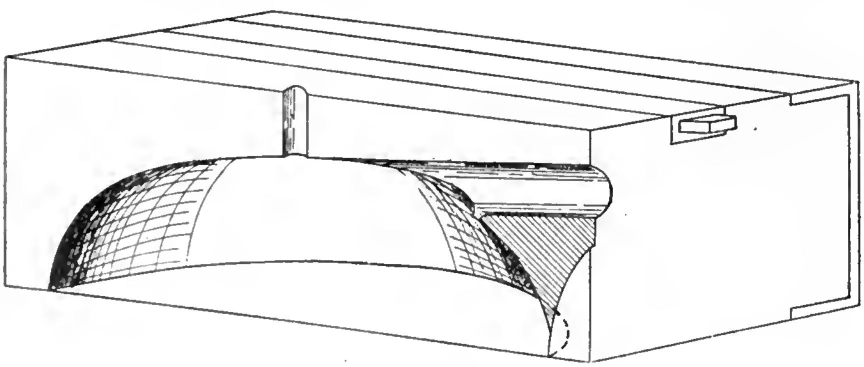


FIG. 5. VIEW OF HALF COPE.

cap is in position. A coating of black wash is now applied to the entire surface of the core, after which the building of the mould is proceeded with.

The Mould

The mould segments which are made on frames similar to those in the core segments, are now placed in position, the first four being accurately located 90 degrees apart on the centre lines shown. The lower ends of these segments rest directly on the toe of the inner segment, and as the cope is held down on top of the mould segments by means of the tie-rods, the core is thus securely fixed in relation to the mould and cope, and the tendency to float or rise when the metal is poured is quite overcome. The lower ends of the mould segments are cored out to form the flange of the casting, two vertical webs in the core forming the slots for the cover bolts.

After the first four segments are accurately located and stayed, the remainder are placed in position: one segment in each quarter being rubbed down to get accurately fitted joints. The lower ends are positioned from an outer ring, Fig. 2, being adjusted by means of bolts and wedges to give the proper thickness of metal in the casting. Green sand is now filled in and rammed behind the segments, a second ring, Fig. 2, being placed about two feet from the top, and the upper end of the segments securely bolted and stayed therefrom.

Runners and Gates

While this filling is in progress the runners are built up as in Figs. 2 and 3. There are three of these formed by means of cored blocks built up from the foundation plate.

Each runner is formed of a separate column of blocks. A hole is cut through the side of one of the blocks which is placed opposite a cored passage in one of the segments. These passages are cored offset so as to enter at a tangent, in order to avoid cutting the face of the core. This arrangement also imparts a circular movement to the metal so that

FIG. 6. SHIPPING THE FINISHED CASTING.

it flows round the core, preventing any excessive local cooling of the metal.

The Cope

The cope is formed in two pieces, the parting being along the line of the drain pipe. As shown in Fig. 5, it includes about two-thirds of the drain pipe, the remaining portion of which is formed in a small two-piece mould as shown in Fig. 2. This small mould supports the outer end of the drain pipe core, and provides a riser at the highest point of the casting. Another riser is also provided in the centre of the casting through which additional metal is poured to take care of shrinkage in cooling.

In order to avoid crushing the cope by tightening the tie rods too much, four stays of heavy tube are placed between the foundation plate and the back staves across the top of the cope. The cope is made of dry sand with coke centres in the thicker portions and vent holes to

allow the escape of steam during the drying.

Pouring

The main runner, Figs. 2 and 3, embraces the three gates which at the commencement of pouring are plugged. When a suitable quantity of metal is in the main runner, the plug is pulled out of the lowest gate, thus giving the first metal the least drop to the bottom of the mould. When a couple of tons have run in, No. 2 plug is pulled, followed by No. 3 plug after a suitable interval.

As the work is special, and the number limited, it was not desirable to go to more expense than necessary to turn out a satisfactory job with existing equipment. The method described meets the requirements of the job, but calls for very careful work in building, as a slight variation in the setting of the mould means a big difference in the weight. So far a limit of two or three hundred pounds has been easily maintained between maximum and minimum weights.

THE ABUSE OF SYSTEM*

By J. Calder

WE organize in order to manage a business undertaking and we manage it through system. It is a weakness in any business if the responsible executives are unable to give on demand a satisfactory account of how it is supposed to function, and we owe a debt of gratitude to those who, during the last decade, have brought to the front the issue that we must always know clearly three things, viz., whom we have to co-operate with, what we have to manage, and how we are supposed to accomplish the work. This knowledge, in proportion, should reach down to the performer of the humblest tasks.

It may be accepted as a general rule that proper selection and instruction of the human factors in organization and management will lead sooner or later to a systematic functioning which will be a natural outgrowth of the needs of the business, while unvitalized red tape will always prove ineffective. System is simply organized common sense. If a system for anything is so involved that its material elements cannot be easily comprehended, have nothing to do with it.

The Earning Value

Set it before you as an axiom that no system is worth any more than it can earn. There are systems of doing things in certain plants to-day which are most ingenious and interesting and yet undesirable from the point of view of profit making. There are systems constructed with rejoicing and lax scrutiny in the years of plenty which are to-day eating off their heads because they have no reducing expense of operation for lean times.

The first question which the experienced investigator usually puts, to himself at least, after all the facts are on the table is not what systems did they have or not have, but "Is the business worth while anyhow?" This is no idle question either. Not a few systematizers have labored valiantly over plants and made sincere promises of betterment which were wholly negatived on the balance sheets because the businesses, irrespective of the systems in use, were inherently unprofitable ventures and could have been readily classified as such with a fraction of the energy spent in spinning the web of a new system.

Tendency to Detail Elaboration

On the whole the tendency has been to over-elaborate detail without regard to profit-making utility in the premises; to construct ornament rather than to ornament construction; to design systems on expensive foundations strong enough to carry a great deal of business that does not exist and never will exist. A decided reaction is now setting in which should not however, be allowed to go too far. Too few people realize to-day on what remarkably small margins many businesses which prosper slowly are carried and could not stand the infliction of new, elaborate and costly plans of operation which guarantee no expansion of trade to justify them.

Undoubtedly we have gained much ground, particularly in specific details of system, but we have also at times been unable to see the forest because of the trees. Take, for instance, the system known as scientific management, which will remain as a monument to its gifted founder. This system has very broad and exclusive claims and insistent detail. It is the best articulated of all the competing systems of business oversight, but it is not the most effective and economical scheme for solving a number of business and industrial problems on which it has been tried. Nor was a trial at all necessary to prove this, and scientific management has suffered because its limitations have not been recognized and its costly functionalization thrust upon small irregular industries not able to take full advantage of it.

In many of our businesses to-day the margin of profit is so small, the labor items so low a factor in the total cost and the work of a few practical executives so economical that it would be folly to inflict upon them in the name of science a more expensive and less efficient routine. Exponents of scientific management have been known to hold that such businesses are inherently weak and should not exist: but science implies action in accordance with the facts, and no system should be permitted to be an end in itself, but should submit at all times to the commercial test of profitableness.

Remedying Unwise Systematization

What is the remedy for unwise systematizing? It is twofold. First, while holding the chief executive of a business wholly responsible for permitting momentous changes in system it is always wise to give his subordinates a chance to offer suggestions on a given plan of outside origin. If this be done the proprietors will be surprised at the number of things they assume about their business which are not so. A passion for facts should override all other considerations, even our most cherished ideas of system detail. The professional systematizer is not guiltless, for, having obtained the ear of the proprietor of a business he has sometimes ridden roughshod over the experienced executives, alienated their support, and pulled up finally a goodly distance along the wrong road to the ultimate discrediting of perfectly sound ideas propagated unfortunately by injudicious and unmannerly agents.

The second aid to correct perspective in applying system is a sound apprehension of what the scientific method essentially is and of its possibilities and relation to the varying factors of business, which is an art rather than a science.

The ability clearly to perceive and avoid inutility in such research is frequently absent in men who are permitted to systematize without thorough business experience. In all such cases wise, capable managements will save time and money by avoiding any attempts to establish a science for irreconcilable variables or infrequent phenomena and will fall back upon an empirical but none the less "common-sense" solution of the problem.

This necessity does not reflect upon the scientific method, which must always face very different conditions in industry and commerce from those met with in nature, and must constantly yield to and be measured solely by considerations of ultimate utility, of available capital and of current product and profit.

In facing the actual problems of industry with full appreciation of what the scientific method might accomplish under certain conditions it is not as a rule necessary or advisable to go into minute details before systematizing actively to some extent. A very comprehensive system takes much time and money to formulate and is rarely born made to order. The responsible executive is called upon to produce rather than to ponder, and if he is wise he will hit the high spots of inefficiency and lack of system at relatively low cost and without delay, leaving the refinements to a later date and probably postponing some of them indefinitely.

*From a paper read before the Efficiency Society recently.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

TURNING JIG FOR LARGE SHELL CUTTERS

G. Barrett

IN a series of articles which lately appeared in "Canadian Machinery," on "Large Shells; Production Problems and Possibilities," the design of a contour cutter for inside boring was described. In making these cutters the toolmaker has been faced with the problem

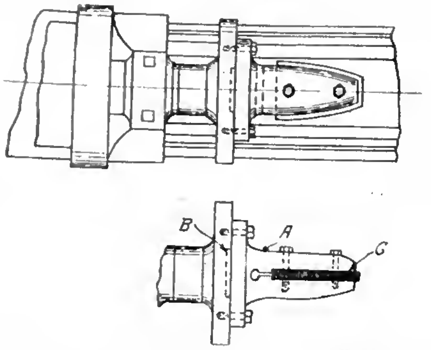


FIG. 1. TURNING JIG FOR LARGE SHELL CUTTERS.

as to the best method to be used in machining them. For this purpose a jig of simple construction has been designed and by referring to the accompanying sketches the reader will be able to judge for himself the results that may be obtained by its use.

The jig proper A, Fig. 1, which is securely bolted to the face-plate, is turned from machine steel, a boss B of sufficient depth being left on the back face, to engage with a corresponding recess in the lathe face plate. A slot C, is milled as shown to take the cutter and a shoulder is left at the back of the slot for the cutter to bear against; a narrower slot, however, being milled from

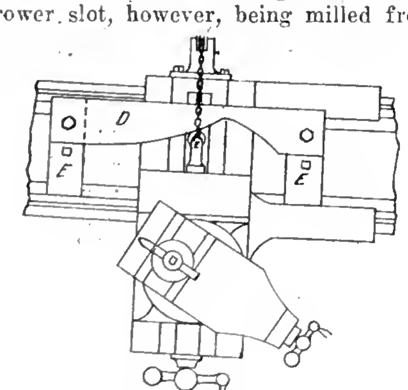


FIG. 2. TURNING JIG FOR LARGE SHELL CUTTERS.

the shoulder to a hole drilled parallel with the back face of the jig, as shown. The cutter is placed in the slot and clamped by the two cap screws, holes being previously drilled in the cutter for this purpose.

The method of turning the profile may be seen by referring to Fig. 2. The camplate D, is bolted in position to the two brackets E, which are secured to the lathe bed. A chain, with weight attached is fastened to the cross-slide and passes over a grooved wheel held in a bracket. By this means the roller, which is also secured to the back of cross-slide in the manner shown, is held in contact with the profile plate. To accomplish this, however, the cross feed screw must be previously removed.

In turning the serrated cutters used for rough boring, it is best to gear up the lathe to cut about eight threads per inch. Allowance must also be left on the cutters for grinding; 1-64 in. being sufficient for this purpose.

APPLICATION OF SPRING PINS TO JIGS AND FIXTURES—II.

By F. Scriber

IN Fig. 6 are shown two types of spring pins suitable for light work, that at the left being simply a pin A, with a groove turned in it, a spring B, and a standard thumb screw pointed to the same angle as the groove in the pin

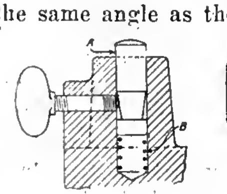


FIG. 6.

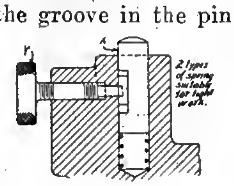


FIG. 6a.

for binding. The pin shown at the right, Fig. 6a, at X, has a knurled screw Y, turned down at the end to fit into the hole in a shoe suitable for coming against a straight flat on the pin. This method is often used when the pin is used as an arbor for locating work. On the foregoing pins, a suitable angle against which to have the binding screw or shoe come for clamping, is found to be from 3° to 5° when these are used for supporting work, and from 8° to 10° when work is clamped on top of them.

Clamping Bushes.

Other very common types of spring pins are clamped by bushings, this being a very convenient way of clamping two pins with one screw as in Fig. 7, where the two pins A, are used for supporting the work shown, by having their top ends beveled. These are rigidly clamped in place by two bushings B. (also shown in the small view) by tightening the screw C, which draws the two bushings towards each other in a manner which is obvious from the illustration. The pin

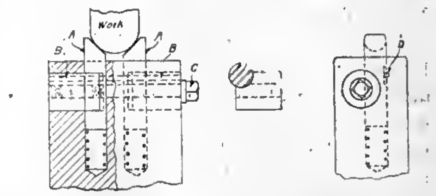


FIG. 7.

D performs the function of keeping the pins A in their proper relation to the work, while interference with their up and down motion is overcome the pins having suitable flats on them.

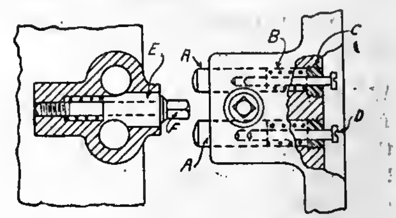


FIG. 8.

Another method of binding by a bushing is shown in Fig. 8 and consists of two pins A which have springs B under them. These latter are held in place by short screws C through which are placed filister head screws D to prevent the pins from springing out. The pins are locked in place when set against the work by a bushing E (made a floating fit in its hole) and the screw F. A spring is placed in front of this bushing to hold it back against the collar on the screw.

Clamping Studs.

The use of studs for clamping spring pins is shown in Fig. 9. The one at the

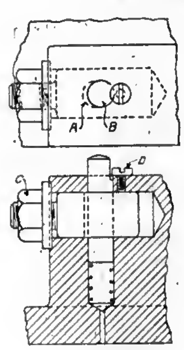


FIG. 9.

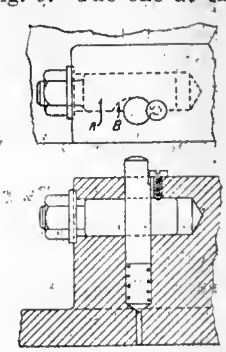


FIG. 9a.

left has an elongated hole in it at A, through which is inserted the spring pin B, the same being clamped by tightening the nut C, thereby pulling out the stud

until it binds the pin while the pin is prevented from springing out of place by the screw D. At the right in Fig. (9a) the stud A is shown set off to one side and therefore a suitable place is cut out at B, for clamping the pin in the same manner as the previous one. At the bottom of these illustrations beneath the

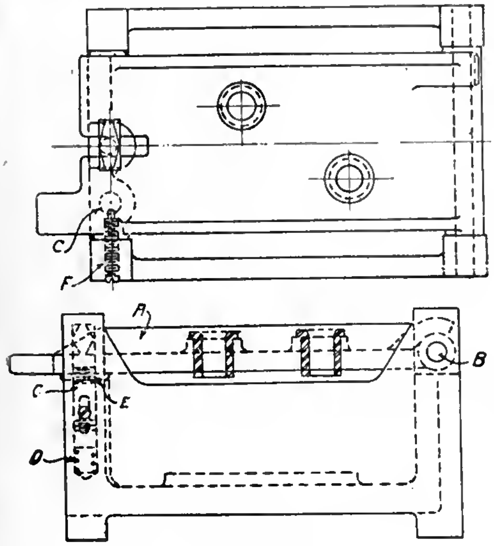


FIG. 10.

springs a small hole is shown and this serves the purpose of an air vent which it is sometimes wise to have as it permits the air to rush out as the pin is forced down. This is often taken care of by a small groove in the pin which can also be used for oil.

Shock Absorbing Spring Pins.

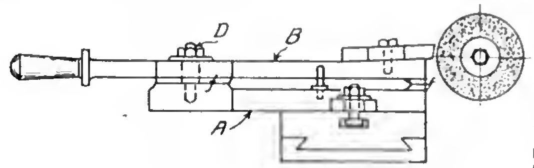
A condition where a spring pin is used as a shock absorber, is shown by the jig Fig. 10. In operating this jig the hinge cover A has to be swung on the pin B, out of the way, in order to remove the work and, as is quite often the case, the loose end is permitted by the operator to drop, when half way down, to its place thus subjecting it to damage, and for this reason the pin C and spring D are used. The pin protrudes above the resting surface E, thus engaging the cover in its descent and breaking its fall, or in other words acting as a shock absorber. This pin is prevented from coming out of place by the screw F.

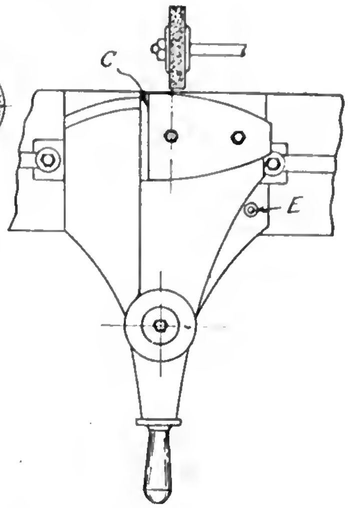
JIG FOR GRINDING LARGE CUTTERS

By P. Simcoe.

A JIG used in grinding large contour cutters consists of a base casting A, which is bolted to the table of the grinder. At the outer end of this casting is placed a stud D, from which the casting B is made to swing the desired radius, this being previously determined so as to be identical with the inside contour of the shell. Casting B is made as shown with a slightly bevelled face, to which the cutter is bolted; the bevel giving the desired clearance to the cutting face of the tool. A tongue C, is also provided, which gives a suitable shoulder for the cutter to draw up against.

In grinding cutters it is best to have them ground straight for a short distance back, as shown, thus when the nose of the cutter is worn down, the same size can be kept by re-grinding the radius. In order to accomplish this a





JIG FOR GRINDING LARGE CUTTERS.

stop pin E, is provided, and is positioned, so as to determine the extent of the curved surface. Thus, when the jig is swung to the pin, the slide of the grinder is turned forward, and a cut fed across the straight face. The cutter is next turned over and similar cuts taken on the other edge. This jig works satisfactorily on all cutters, and is found to be a time-saver and to produce accurately finished work.

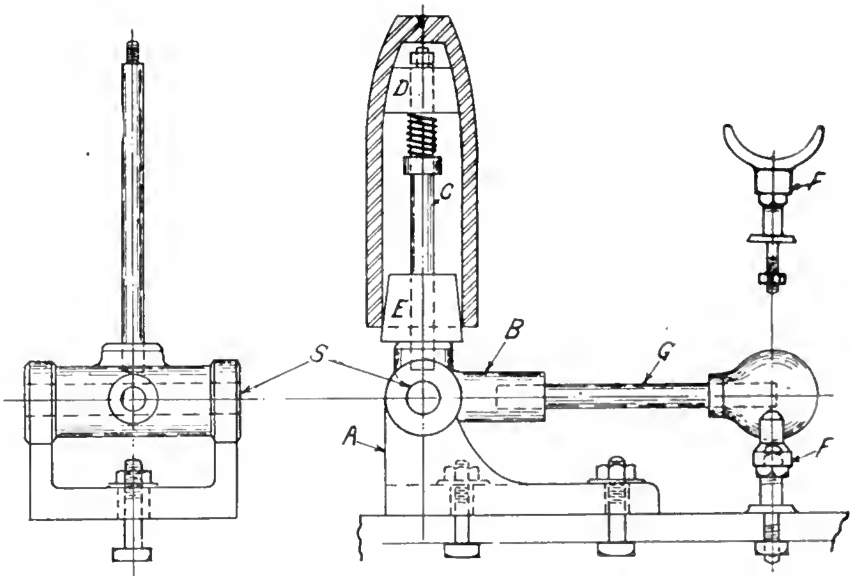
CENTREING JIG FOR H.E. SHELLS

By B. Hamilton

THE accompanying illustration shows a type of centreing jig which is proving efficient on shells of the larger diameters. The base casting A, which is bolted to the drilling machine base has two upright brackets which support the shaft S and the swing block B. The latter has two central bosses, as shown, at right angles to each other, and which are bored to suit the upright spindle C. and the horizontal spindle G. The upright spindle carries two cones D and E, which are made, respectively, a sliding and tight fit. The cone D is supported by means of a suitable collar and a spring of the required tension which allows the forging to seat itself on the bottom cone, while at the same time the bushing D, centres itself with the bore of the forging near the base.

The adjustable bracket F, is also bolted to the machine base, its purpose being to support the counterbalance weight. This bracket is adjusted by the check nut, so that when the weight rests upon it the centre hole is plumb with the drill spindle.

The special purpose of this jig is to lift the shells from the floor. This may be accomplished by raising the weight, thus placing the cone spindle horizontal with the floor. Rolls are provided by means of which the shells may be rolled directly on to the spindle, thus doing away with any lifting while at the same time proving a great time saver.



CENTERING JIG FOR HIGH EXPLOSIVE SHELLS.

REMEDYING A HOT SPINDLE BEARING

By C. T. R.

A LATHE which was used in rough turning shrapnel forgings gave a considerable amount of trouble on account of the heating of one of the bearings. This was accounted for, by the continuous heavy work and the fact that the thrust was all against one bearing. To overcome this it was decided to cut about 1½ in. off the boss shown in Fig. 1, and to place in its stead a fibre washer and a steel collar, which would then enable the thrust to be equally divided between the two bearings.

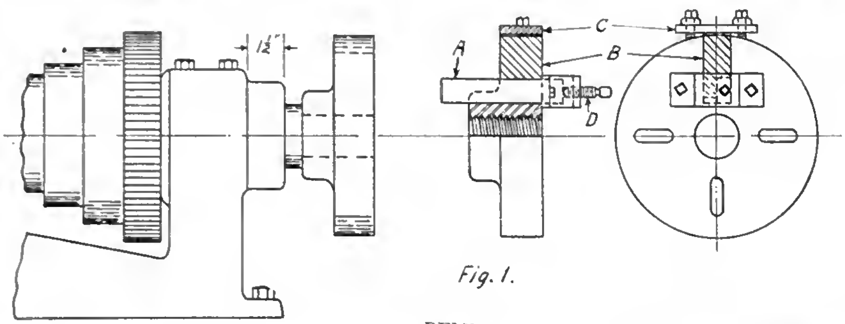


Fig. 1.

REMEDYING A HOT SPINDLE BEARING.

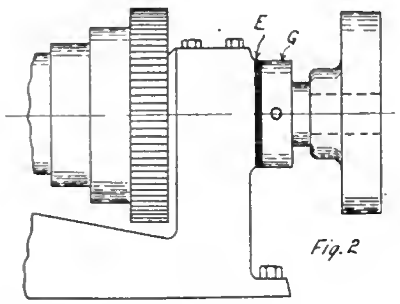


Fig. 2

In order to remove the excess metal it was necessary to have some kind of tool-post, and for this purpose a small face plate was used. The bottom of the face-plate slot was squared to take the tool A, which was wide enough to cover the boss. The tool was held in place by the packing B and the clamp C. A bracket F, was secured to the face plate as shown, and by means of the set screw D, the tool was fed into the work. After the boss was cut away the lathe spindle was threaded to receive the collar and washer; the completed job appearing as shown in Fig. 2.

Questions and Answers

Question—(a).—What is the corresponding reading on the Centigrade thermometer of 200° Fahrenheit?

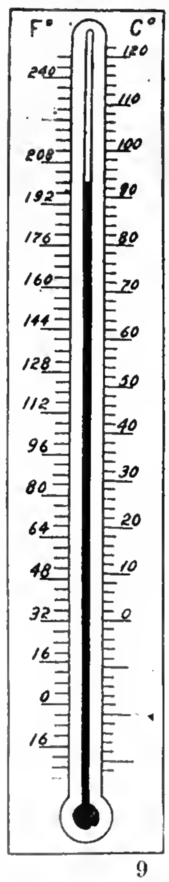
(b)—What is the method used in changing a reading from one scale to the other?

Answer—(a).— 93 1-3 degrees centigrade, see Fig.

(b)—The boiling point on the Fahrenheit scale is 212 degrees, and on the Centigrade scale 100 degrees. The zero reading on the Centigrade thermometer is at the freezing point, while the freezing temperature on the Fahrenheit scale is 32 degrees above zero; therefore the space occupied by 100 degrees on the Centigrade scale is divided into 212—32 = 180 degrees, and the proportional space for each degree is

$$\frac{180}{100} = \frac{9}{5} \text{ or } \frac{100}{180} = \frac{5}{9}$$

Then by taking 9/5 of any Centigrade reading and adding 32 the result will be the same temperature on the Fahrenheit scale; or by subtracting 32 from any Fahrenheit reading and taking 5/9 of the remainder the result will be the corresponding temperature on the Centigrade scale.



By formula $F = \frac{9}{5} C + 32$ or $C = \frac{5}{9} (F—32)$; thus to change 200° F to corresponding temperature on C. scale we have

$$C = \frac{5}{9} (F—32) = \frac{5}{9} (200—32) = \frac{5}{9} \text{ of } \frac{168}{1} = \frac{280}{3} = 93 \text{ 1-3 degrees.}$$

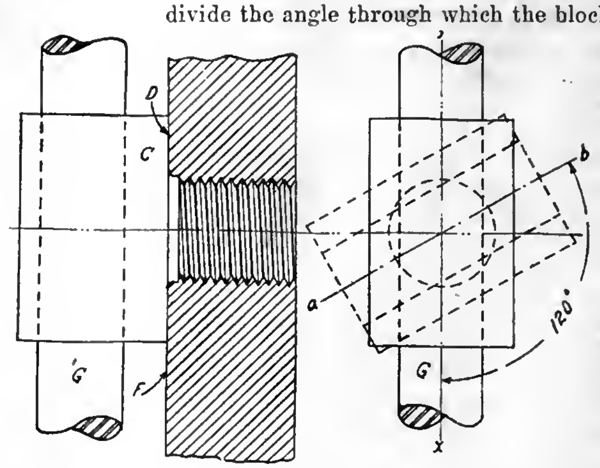
* * *

Question—(a).—The block C with the threaded stem is required to screw into the frame F, so that the bearing for the shaft G will be in a vertical position. If upon trial it is found that the shoulder of the block tightens on the frame, at a point 120 degrees from the required position, what amount of stock should be removed from the shoulder D to allow block to tighten in the desired position, the threads on the stem being 9 to the inch?

(b)—What general rule could be used for problems of a similar nature to determine the approximate amount of stock removal, to tighten a shoulder block in a desired position?

Answer—(a).—As the dotted lines show the trial position of block and the full lines the desired position, sufficient stock must be removed to permit the block to turn through an angle of 120°, or 1/3 of a complete turn. As the pitch of the screw is 1/9 inch, the stock to be taken from the shoulder will be 1-3 of 1-9 = 1-27 inch, or .037 inch.

(b).—A fairly accurate method is to divide the angle through which the block is to be turned by 360, and multiply by the pitch of the screw, or by formula



$$C = \frac{a}{360} \times P, \text{ when}$$

C = amount of stock to be removed from shoulder.

a = angle through which block is to be turned to tighten in desired position.

P = pitch of screw.

Thus from the above question,

$$C = \frac{a}{360} \times P = \frac{120}{360} \times \frac{1}{9} = .037 \text{ inch.}$$

Industrial Safety and the Principles of Management--II.

By W. P. Barba

The leading countries of the Western Hemisphere have been slow in following the examples set by European nations in the matter of workmen's compensation laws. Pennsylvania recently became the twenty-fourth state to adopt a law of this nature, however, and the remarks of the writer indicate the trend of public and private opinion on this subject.

THE works the author is associated with has for years made a physical examination of each man offering for employment, having in mind his condition with reference to health, present and potential, his record as to previous injuries and their results, his eyesight, hearing and whatever condition will affect his value both as an individual and as affecting his fellow-workmen.

Disease Spreaders Rejected

At one works there were offered for employment, practically hired, then turned over to the physicians for this examination 2,569 men during the year 1913; of these, 391, or 20 per cent., were rejected for venereal diseases and consequences, it being deemed most unsafe to turn loose a man possibly syphilitic amongst presumably clean fellow-workers. Of course, a man may pass inspection upon employment, and then find his health go down. He may become the subject of venereal disorder, or some other form of communicable disease. The answer for this is the growing need for periodical examination of each individual worker, and his elimination when his risk becomes too great. This periodical examination of employees has been undertaken to much too small an extent, and needs attention and developing. The benefits are numerous, the first and chief being the aid and assistance to full recovery, and checking in advance of disease which a man unconsciously fights off until he drops—mastered. Beaten by exposure to a blizzard or heavy storm when in a reduced condition, many a good man is lost, who, by a regular, even though cursory, examination might have been saved through timely catching, checking and conquering, through advice and aid, of an ailment creeping up on a man almost without his knowledge of anything going wrong. In this connection arises the demand, a just one, for some form of insurance, preferably mutual, and upon a sliding scale, according to the risk offered by each man. This is but one of the many problems each executive is going to face in the future handling of employees' matters.

Necessity for Instruction

When a man is hired, he should be taken to his foreman for careful instruction in his duties, its dangers and their safeguards pointed out, and every effort made to prevent the new employee from becoming worse than a normal risk. As one concrete illustration of this, in a certain large works much fuel oil is used for heating purposes, and a comprehensive system of storage and distribution is installed. Leakage is impossible to entirely prevent, and numerous explosions and small fires have occurred. It is necessary at times to descend into the pits in which the apparatus is placed, and the explosive fumes of oil and air are frequently present; steam pipes (not air—because of the danger of air) are rigged in all such places and at stated intervals the steam is sent through these chambers entirely and safely displacing all noxious gases.

Again, the burners for fuel oil are merely a combination of jets and valves —some of the jets embodying the injector principle. Each man who is called upon to work with this apparatus is taken into the bureau of Safety First by his foreman, and with the safety engineer (a high-priced executive) is taken through a course in his particular oil burning apparatus. The collected unit is there, it is dissassembled and reassembled by the man, and a partly cut-out section is shown, so that all the functions of the system are fully understood by the workman. Since the introduction of this system of instruction, the number of burns and fires from ignorant handling has been very much reduced.

Safety Inspector

In 1907, in a near-by large works, the safety movement was given a real start, by the appointment of a safety officer, whose whole duty was to report hazardous conditions of plant and equipment and see that the conditions were corrected. It has lately been more generally recognized as the function of the factory inspector of the State to keep every manufacturing establishment in a safe condition, so far as equipment, etc., is concerned. The present incumbent in Pennsylvania, Dr. John Price Jackson, has given real value to this function for the first time, but even he, up-to-date and progressive as he is, recognizes that the correct way is to make each factory safe automatically by having liability laws which properly penalize the lax employers.

Employees' Committee

The attempt of 1907 to effect safety of equipment by the appointment of a safety officer and his staff, in the works mentioned, was soon superseded by a plan to make the worker himself feel his share of the responsibility, and a committee of 70 men was chosen from among the employees, there being upward of 5,000 employees. These men were always on duty while regularly working, and seven of them were chosen each week and with the safety engineer gave up a whole day in the company's time and pay to actual examination of conditions of plant and equipment. Their recommendations were given priority by heads of departments and the works were soon found in such good physical shape that the committees had little or nothing more to report.

The number of accidents was, of course, reduced, but not to a point which was thought commensurate with the efforts put forth. During all of this time (five years) careful study and analysis was given the daily accident reports, with the result that they soon segregated into three groups:

1. Hazards of occupation.
2. Hazards due to faulty equipment.
3. Hazards due to personal carelessness and disregard of safety appliances.

These regularly occurred in almost unchanging proportions, even though the sum total went steadily downward:

The first class—Hazards of occupation, 24 per cent.

The second—Faulty equipment, 3 per cent.

The third—Carelessness and neglect, 73 per cent.

This large proportion, 73 per cent., is purely a result of the operation of the personal equation, and at once suggested itself as the point of attack.

To meet this a total change of programme was inaugurated. The plant was divided into seventeen distinct units or geographical districts, and a committee of three was appointed in each for a term of two months. A datum line for each district was established from history which showed the frequency of accidents in each district. The figures were worked out in units per one hundred men employed for the period of two months, thus affording easy comparison.

The task set was for each district to

*Presented at the Philadelphia local section of the American Society of Mechanical Engineers, Nov. 23, 1915.

equal or beat its previous record. No district was set against another, its record being wholly within itself. This is a vital point. Each sixty days' record is merged into the previous total, and thus a new record automatically set. For a committee which equalled or beat its district record during the committee's sixty-day term, there was established for each man a cash prize of a ten-dollar gold piece, or $30 for each winning district each sixty days (incidentally the amount thus paid during the year 1914 was $3,200, and no sum was ever more cheerfully paid out). In addition, the committee which made the greatest improvement upon its own record was, each period, granted a double prize, or $20 to each of the three men.

Prize Distribution

The experience of the first year was that out of the seventeen districts there were paid prizes all the way from four up to sixteen districts, the four being midway in the year, and the treatment applied by the management when this low score occurred, brought the score right up, so that at the last period fourteen sets of prizes were paid. The personnel of these committees is changed each period, so that the experience gained is accumulated by a large number of men.

The treatment in this case was simply for the general manager to talk to the assembly of the men later referred to, and point out, from knowledge of the accidents occurring during the period when low scores were made, how greater vigilance, less laxness, more attention to the men seen to take hazards carelessly, would result in better scores, more gold pieces, less suffering, to risk of which each of the whole number of employees is subject, whenever vigilance in these particulars is relaxed.

There is also a collateral advantage which is a large part of the value of this new scheme. The management hires a large and convenient hall for a meeting place, provides cigars and light refreshments, invites all the men the hall will contain (about 400) and makes a public occasion of the presenting of the prizes. A free discussion of methods and experience is had, and from 8 o'clock to 9.30 an evening is spent which is most profitable in every way. Stimulation is given the safety movement, the managers are all there, and a great feeling of the community of interest of all concerned is engendered. The spirit of full co-operation is established and fostered, a better and closer acquaintance is had on all sides, and the whole effect is most beneficial.

The net result in figures is curious and interesting. By an accident is meant the state requirement or definition—that a man is away from his work more than two days. The number of accidents during the year just closed was reduced by 59 per cent., the three above classes being represented by 26.8 per cent., 2.23 per cent., and 71 per cent., clearly showing that there is still more work to be done in fully bringing home to the individual his personal share in the responsibility for his injury.

This responsibility is going to be more closely brought home under compensation acts, since it will mean the elimination of men who are thus injured through their own fault too frequently; these men will be compelled to seek other employment. It then becomes a nice point of judgment for the management to determine whether its investment in such a man, i.e., his trained capacity for his work, is a sufficient offset against his increased risk, due to his propensity for acquiring injuries to an undue degree. Some of the compensation laws refuse a man any payment if it be shown that he was injured by his own act for the purpose of going on the benefit list. This provision and the one denying benefit for the first fourteen days are about the only safeguards the employer has against unjust claims for payments.

Reverting to the system suggested of avoiding discharge losses through conviction and fines, the proper channel for restoring fines upon delinquents to circulation through the whole mass of employees is—the recognized need of caring in some way for the reliable employees unavoidably injured slightly, and returning to work within the fourteen days' exemption period provided by recent compensation laws.

A fund could be provided, augmented by the company, especially so in the case of larger employers, this fund to be administered by a mixed board of employees, and a small measure of financial relief afforded the unfortunates who recover within fourteen days. This period, designed by framers of the acts to prevent malingering, does not altogether effect this, and meanwhile works a real hardship on many worthy men whose needs are such that the uncompensated loss of any days becomes a matter of concern.

Federal Legislation Required

If ever there was a subject fit for Federal instead of State legislation it is this one of liability and compensation. Fifty-eight States, working each alone, may produce such wide diversity of legislation as really to put neighboring States into competition for both manufacturers and for workmen. When John P. Neill was Federal Commissioner of Labor he worked assiduously to secure uniform State legislation on this subject because there were statutory difficulties in the way of a Federal Act. This leaves it up to the several States, where too often a subject of this magnitude is taken up by untrained and uninformed legislators who can, quite possibly, be swept into ill-considered action by a wave of hysterical outcry from the newspapers, professional labor leaders, and publicists who treat a situation academically and without close knowledge of the problem.

With especial reference to the Pennsylvania law just enacted, it is fine to recall how this law was prepared. Begun under Governor Tener by a board of broad expert business men, thrown out by the Legislature of 1913, brought up again by a Governor fearless of criticism, worked out modernly upon the basis of the original commission's draft, the Pennsylvania law is, generally speaking, satisfactory to all groups, and there is in it opportunity to co-operate fully, to protect those dependent upon their labor for daily bread, automatic incentive to clean, healthful surroundings, care in safeguarding equipment, and all concerned are compelled to do their utmost to achieve the blessed result desired.

Any employer, or rather fellow-employee, who shall disregard the plain common sense demands for a legitimate, well-considered scheme for automatic compensation for every injury not wilfully incurred, is not alive to his business, to his duties, to his men or to his stockholders, nor to his duties to the progress of humanity at large.

Cause of Industrial Unrest

It is the speaker's firm conviction that the so-called industrial unrest is wholly preventable, is due chiefly to lack of understanding of the problem—lack of patient working in full co-operation with all concerned, and the result of following sound principles with policies based thereon is certain to prevent unrest such as has been all too frequent from just such causes.

In pointing out the dangers of haste in enacting such legislation, all right-thinking people are urged to work for the passage of such laws as will compel the lax, careless, or unwilling employers to secure the co-operation toward safety of workers whose livelihood and lives are in the hands of those who pay wages, and as before mentioned should find it a cheerful duty to work toward the securing through co-operative effort of the maximum of safety, comfort and happiness among all grades of employees. Only thus will the work of the world be furthered. Only thus will there be removed from among us strife, discord, class distinction, unions and non-union, and there will surely come into industrial life the big rewards which result from careful thought along lines which go to promote full co-operation amongst those called to do the work of the world.

Electric Welding Processes: Developments and Applications-II*

By C. B. Auel **

The development of electric welding to its present state of perfection, has been noteworthy not only for the economies effected over previous methods of doing the same work, but also for rendering possible the production of many articles and the performance of numerous operations which were formerly quite impracticable as commercial propositions.

THE incandescent or resistance processes of welding differ from the arc processes, not only in the method of obtaining the heating effect of the electric current, but in the further fact that pressure is also an essential factor. It is the introduction of resistance into the circuit such as is caused by a poor contact (Thomson process) or by a poor conductor (La Grange-Hoho process) that produces the necessary heat for welding.

La Grange-Hoho Process

In the La Grange-Hoho process an electrolytic bath is required. The passage of the current through the bath causes decomposition of the electrolyte, bubbles of hydrogen being deposited on the metals to be welded, thus introducing a gaseous resistance in the region of contact between the metals and the electrolyte, with the consequent heating of the metals to incandescence. When the metals reach the proper fusing temperature and while still continuing in the bath, they are forced together under heavy pressure, thus uniting, or they may be withdrawn from the bath after reaching the fusing temperature and welded together under a hammer in the usual manner. As far as it has been possible to ascertain, the process is not used in this country at all.

Thomson Process

In the Thomson process the welding is effected in the secondary circuit of a single phase (25 to 60 cycle) transformer, which may have a capacity from 1 to 100 kw. or more, the primary being wound for any suitable voltage, the secondary for ½ to 7 volts. The terminals of the secondary circuit generally consist of comparatively large jaws, frequently water-cooled, which clamp the metals to be welded. The power factor of a welding machine of this type will range from 50 to 85 per cent.

In the making of a weld the ends of the two metals are butted together, first being filed flat if necessary, the lengths of each actually in the circuit being so adjusted as to make them equal in resistance, after which the primary circuit is closed. Current immediately flows through the metals, heating them quickly at their point of contact to the temperature of fusion. They are then forced together by hand or automatically. In certain phases of this process, as the spot welding of sheet metals and the equivalent, the metals to be welded are not clamped in jaws but are squeezed together between the electrodes of the secondary circuit.

Since the operation of welding is at all times under control, the weld may be made quickly or slowly and there is, therefore, no waste of current; furthermore, the heat is self-contained, that is it is generated within the metals themselves and is, consequently, confined to the small portions between the jaws or electrodes. It is evident that the quality of the welds made by this process should be uniformly higher than those made by any of the arc processes or by the blacksmith, and it is, in fact, only exceeded by the electro-percussive process. The Thomson process is best adapted for repetition work, while the arc processes are rather the reverse. The energy consumption involved in the making of a weld, and omitting all reference to the apparatus itself and the efficiency of operating it, is dependent upon the thermal and the electrical conductivity of the metals, their shapes, lengths, cross-sections, temperatures of fusion and time consumed in welding.

The Thomson process has a wide range as regards the metals as well as the shapes it is possible to weld, and the following covers the metals and alloys which can be welded:

Alloys.—Various grades of tool steel. Various grades of mild steel. Steel castings. Chrome steel. Mushet steel. Stubs steel. Crescent steel. Bessemer steel. Nickel steel. Wrought brass. Gun mtal. Brass composition. Fuse metal. Type metal. Solder metal. German silver. Aluminum alloyed with iron. Aluminum brass. Aluminum bronze. Phosphor bronze. Silicon bronze. Coin silver. Various grades gold.

Combinations.—Copper to brass. Copper to German silver. Copper to gold. Copper to silver. Brass to wrought iron. Tin to zinc. Tin to brass. Brass to German silver. Brass to platinum. Brass to tin. Brass to mild steel. Wrought iron to cast steel. Wrought iron to mild steel. Steel to platinum. Wrought iron to tool steel. Gold to German silver. Gold to silver. Gold to platinum. Silver to platinum. Wrought iron to mushet steel. Wrought iron to stubs steel. Wrought iron to crescent steel. Wrought iron to cast brass. Wrought iron to German silver. Wrought iron to nickel. Tin to lead. Mild steel to tool steel. Nickel steel to machine steel.

Wires as small as 0.0225 in. diameter can be butt-welded, the strengths of the joints being dependent upon the composition of the materials welded, in general varying from 75 per cent. and upwards of the original stock, although certain investigators place the average as low as 63 per cent. Aluminum wires or rods can be successfully welded in the larger sizes; but, in the smaller sizes, the welds will be unreliable, practically disintegrating if any attempt is made to work them.

Aside from the welding of wires, there is a multiplicity of other work, some large, some small, which can be advantageously performed by this process. Among such may be mentioned the welding of rings, buckles, frames for windows and the like, bars, rods, pipe, automobile parts, wheels, tires, cylinders, rails, bonds chains, band-saws, wire fence, handles to blades, drills, high speed to machine steel for cutting tools, crankshafts, etc. One of the most novel applications is the bonding of street car rails. Similar to this application is that of rail welding, but on a much larger scale. In this, about 30,000 amp. at 5 to 7 volts are applied for 2 to 3 min. with a pressure of 4,000 lb. per square inch on the weld.

Later developments of the incandescent or resistance process of welding include what are known as spot, point, ridge, projection and button welding, etc., much of it serving as a most desirable substitute for riveting. Briefly, it is the welding of materials in spots or at points and may be accomplished either by simply laying the flat materials together and applying both heat and pressure through the medium of the electrodes, as in the case of thin sheets; or, by first forming points, ridges or projections on the materials when thicker, then applying both heat and pressure; or, by laying the materials together when still thicker and placing between or on either side, a small flat metal button, then applying heat and pressure.

Fig. 4 shows two views of sheets clamped between the electrodes of a spot-welding machine preparatory to being welded. In one of the views, the indentations have been made in one sheet only, in the other they have been made in both.

A still further application of the incandescent process is in the lap welding of thin ribbons, especially those of metals like nickel-chromium on which an oxide forms which is not readily removed. By the use of an embossing tool, such as a pair of pliers with faces like a file and between which the ribbons are squeezed before welding, many exceed-

*Abstract of a paper read before the International Engineering Congress, San Francisco, Sept. 20-25, 1915.

**Director of standards, processes and materials, Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa.

inly small points are raised over the surfaces. The scale is thus broken down and good contact secured between the pieces of ribbon when subsequently placed together for welding. The welding may then be readily effected by placing the ribbons between electrodes, also fashioned like pliers, properly insulated and held in the hand during the operation.

Electric Brazing

Electric brazing has received comparatively little attention, yet many materials can be effectively joined in this manner. A spot-welding machine can usually be employed with very little al-

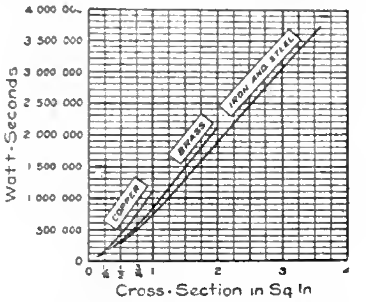


FIG. 3—ENERGY CURVES FOR WELDING DIFFERENT METALS

teration, one or both terminals being of carbon or steel, as circumstance require. The "spelter" may for most purposes be either sheet brass or sheet silver from 0.005 in. to 0.015 in. thick, and the flux, when it is found necessary to use any, may be a saturated solution of borax water. The heat, as in welding, is so perfectly controlled that there is no danger of burning the materials. Furthermore, a spot-welding machine, when it reaches its maximum limit in welding, can do still larger work in brazing owing to the lower degree of heat required. When silver "spelter" is used, the joint is more flexible than a welded joint, and there is little danger from brittleness.

The time for brazing a joint will naturally be rather longer than that required for welding, and care must be taken where brazed joints lie extremely close to one another, that the heat from the joint being brazed, does not react on the joint previously brazed and undo it; or does not extend to the next joint to be brazed and heat it sufficiently to cause an oxide to form thus preventing brazing at all. These are, of course, the two extremes and are, ordinarily, not likely to occur; but where there is any possibility of such conditions, dampened asbestos will prevent the former and borax water the latter.

Electric soldering may be done in much the same manner as electric brazing, though it is perhaps more usual to butt together the metals to be soldered and after heating them to apply the solder by means of a soldering stick, rather than to use sheet spelter as in brazing.

Electro-Percussive Welding

As the electro-percussive method of welding is of more recent origin than any of the other methods, less is known of its ultimate possibilities, more especially with reference to its adaptability. It will weld together any two metals, whether alike or unlike as to their composition, melting point, conductance, in fact, quite regardless of their characteristics, though such combinations as silver and tin, or aluminum and tin, iron or lead will of course not be permanent any more than they will be when welded by any other method, since their alloys disintegrate in time. Thus far, this method has been largely confined to the welding of small wires or the equivalent, aluminum to aluminum or copper, platinum to nickel or copper, thermocouples, spring steel, etc.

The principle involved is that of percussive contact between two metals with a condenser discharge occurring at the instant of such contact. The various items involved include voltage, velocity and force of impact, capacity of condenser, resistance and inductance of circuit, these being, of course, properly proportioned to one another.

Fig. 5 is a schematic diagram of the method. The welder is much on the order of a miniature pile-driver, two grips for holding the metals to be welded being provided, one of these located at the base and corresponding to the pile, except that it is stationary, the other corresponding to the driver and dropping upon the pile. A small direct current generator, G, preferably of 250 volts and about 1 kw. capacity, which is used to charge a condenser C of the electrolytic type, through a high resistance R. Voltage control is secured through variation in the field of the generator, as well as by means of resistances, R and R'. The welding apparatus proper W-W is connected to the condenser through an inductance L, long

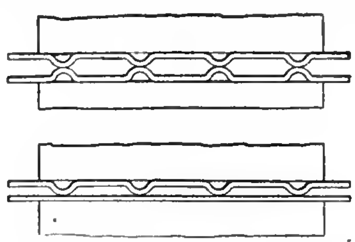


FIG. 4—METAL SHEETS ARRANGED FOR SPOT WELDING

flexible leads being used to permit ready moving of the welder from place to place without the necessity of disturbing the auxiliaries. The terminals of the welder are bridged by the switch S, except in the actual making of a weld when the switch is opened; thus no potential difference exists between the terminals while inserting or removing wires from the welder.

In making a weld either the metals to be welded, or if wires, their ends, are placed in the grips; the switch S is then opened, charging the condenser. A catch is finally released allowing the driver or hammer to fall, bringing the metals in so doing into percussive contact and making the weld which only requires the removal of the burr to complete it.

In explanation of the theory connected with the operation, it may be said that at the instant of contact, the condenser current is so heavy that the ends of the abutting metals are vaporized by the explosive discharge; and, due to the blow delivered by the falling mass, are forged together. The heat produced, though intense, is developed so quickly that it is confined to the extreme sur-

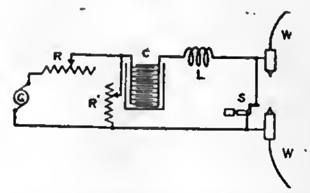


FIG. 5—DIAGRAM OF ELECTRO-PERCUSSIVE WELDER

faces of the metals and there is, therefore, no opportunity for unequal heating; with its possible deleterious effect on the welded materials. This generation of heat is dependent upon there being a certain resistance in circuit at the ends of the metals being welded at the instant of their contact. It is, therefore, necessary to "V" them at right angles to each other with a pair of pliers.

The condenser current vaporizes the extremely small sections of the abutting metals and melts immediately thereafter the approaching surfaces of the two metals. This vaporization must of necessity result in a separation of the metals for an instant, not, however, due to any reversal in the direction of travel of the falling metal but simply because the rate of vaporization is greater than the velocity of the approaching surfaces. Upon the metals coming together again, the arc is extinguished and forging occurs.

The weld takes the form of a sharp dividing line between the two metals, and on each side of it the original materials are found with no change in their physical properties, such as brittleness for example, either at or near the weld, as sometimes occurs in the resistance or incandescent method of welding. Hard drawn materials are not softened, soft materials are not hardened, nor is the temper of springs affected. Several theories have been advanced to account for these apparently irreconcilable statements. The almost instantaneous heating and cooling may not give time for molecular changes; or, if it does, the amount of material affected may be inappreciable.

CAST STEEL GEARING

By T. E. C. H.

THE efficient design of gearing has undoubtedly met with its due share of attention, but most articles the writer has seen have dealt more with the shape and strength of the teeth than with the design of the body of the wheel itself. The following may not therefore be out of place as an attempt to consider wheel body design in the case of cast steel gearing.

Disc Wheels

These are now very seldom employed over two feet diameter, and although of the simplest design, it is not uncommon to find the holes in the web left out, these holes being essential to enable the metal to contract in cooling without leaving a permanent strain. See Figs. 1 and 2. When the rim is rather wide, small webs connecting it and the boss to the web are also advisable, and help when pouring the metal, but for appearance some designers prefer to leave them out.

Arms

The cross or star shape arm for cast steel wheels seems to be passing away, and although to many the appearance is good, the difficulty of obtaining clean castings in steel without extra trouble tells against it.

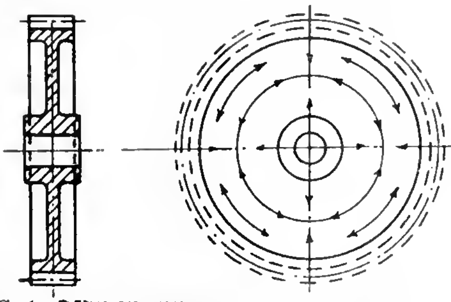


FIG. 1. DISC WHEEL SHOWING STRAINS SET UP WHEN METAL COOLS DOWN AFTER CASTING.

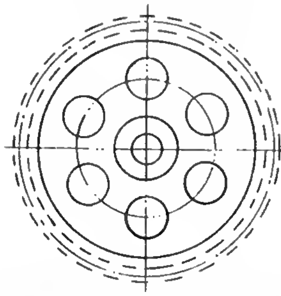


FIG. 2. DISC WHEEL WITH HOLES TO RELIEVE STRAINS DUE TO COOLING AFTER CASTING.

H. Section Arms

This design of arm is now the rule, and the question designers have to ask themselves is not what kind of arm, but how many, and what are the thicknesses. The following rules are suggested:

A—With teeth below thirty in number and of large pitch there generally arises no question of strength of arms. These being, when made the minimum thickness permissible for casting purposes, many times of greater strength than that required to take the load.

B—With teeth above thirty in number and of large pitch, then by dividing the load by the number of arms and assuming that the rim acts as a rigid strut between the arms, the bending moment to be resisted by one arm can be obtained, and the strength of the arm checked. To obtain a greater strength of rim, so as to ensure that the assumption holds true, that the rim will act as a rigid strut, and also to offer a greater resistance to bending when the pinion is engaging with the teeth between the arms, the under web of the rim is increased in depth at the centre as shewn by the arrow marks in Fig. 3. This by many is, however, not considered to give a neat appearance.

C—In the case of teeth being above fifty in number and of large pitch, it should be noted that with every increase in number of teeth the assumption that the rim can act as a strut does not hold, and thus the strength of the arm must be determined by the bending moment which one arm must resist, the load being that on each tooth.

Number of Arms

This should depend upon whether the wheel is to have machine cut or cast teeth. When cast as a blank with the rim more than twice the final thickness, it is advisable to make the arms fewer in number, but of slightly greater thickness for casting purposes; a compromise, however, is necessary, or else, after the teeth are cut, the arms would be a great deal stronger than the rim. By increasing the thickness of the web under the rim this difficulty is overcome.

Sections of H. Arm

The web of the arms are now being made thinner than the flanges, this enables the metal where the rim joins the arm to contract easily. In a large wheel, a space is left between the arm web and the rim for this purpose, as shown in the section rim, Fig. 3. Besides helping cooling, the weight of the wheel is not only reduced by this design, but its strength is at the same time increased by so doing. For instance no structural engineer would increase the thickness of the web of a girder to increase its strength, yet even to-day in many of the designs of gear wheel the web is very often twice the necessary thickness.

Split Wheels

The question of easy access to the clamping bolts of split wheels is now receiving its due share of attention, and the bolts near the boss which have been the greatest offenders in this respect can easily be made to pass through the web of the arms, as shown in Fig. 4. Only with wheels for high speed duty with very wide faces and small pitches do the rings shrunk on the boss seem to be favored. The bolts near the rim are often staggered to ensure greater ease in assembly, and it is now very seldom that they have to be tightened up by the old method of knocking the nuts round with hammer and chisel.—Herbert's Monthly.

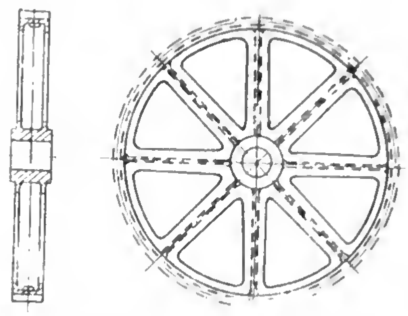


FIG. 3. CAST STEEL WHEEL WITH H-SECTION ARMS.

SERVICE

SOME men go through life like a freight car with a predetermined capacity marked plainly on their countenances—one dollar a day, and these people presume to call it service. This is not service—this is slavery.

The possibility of a man receiving more pay, for giving better service, is vindicated by the splendid roster of men who have fought their way up through the ranks to rare individuality.

Service is not a heritage; service is an advantage conferred or brought about.

When a man gets a larger, a firmer grip on individual effort—when a man discovers that he is not a mere music box, with a limited number of tunes; but that he is a master violin with infinite possibilities; then, not until then, will he fully realize the opportunities that follow good service. There never was a good man without ability for some service. The point is, find your calling.

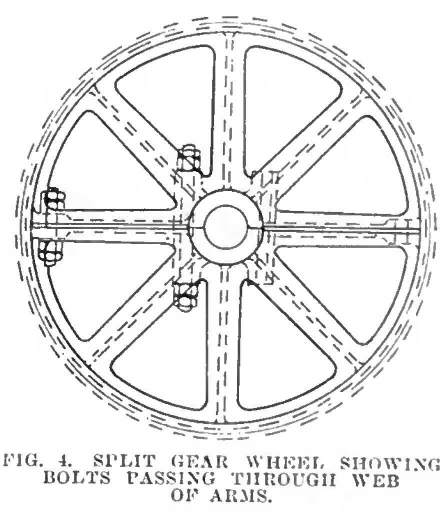


FIG. 4. SPLIT GEAR WHEEL SHOWING BOLTS PASSING THROUGH WEB OF ARMS.

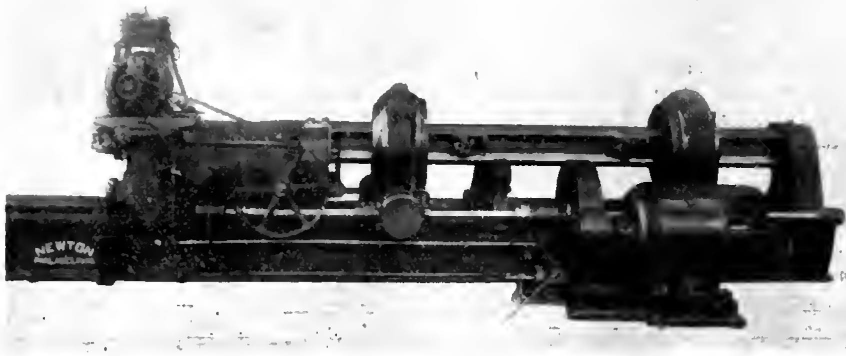
Service makes men victors of their course, not victims of the current.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

TORPEDO FLASK BORING MACHINE

A NOVEL type of horizontal boring machine for the finished boring of torpedo flasks, has been developed by the Newton Machine Tool Works, Inc., of Philadelphia. The design embodies several constructional and operating features for which patent rights have been requested, the various improvements resulting in the work being completed in one-quarter of the time formerly required.



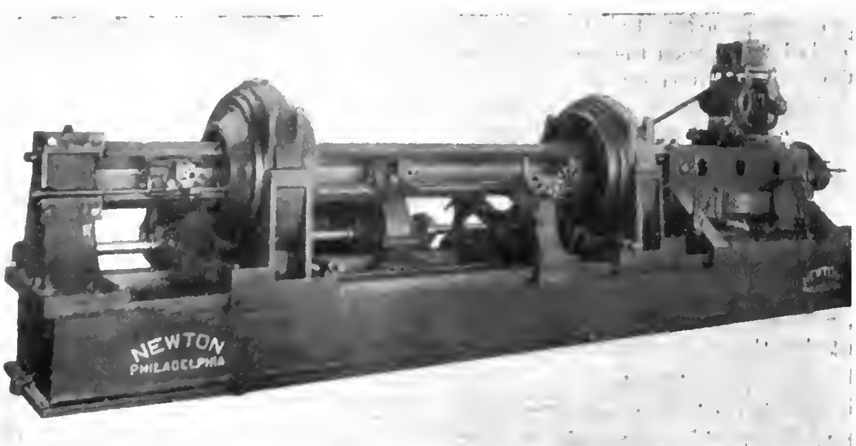
REAR VIEW OF MACHINE SHOWING MAIN DRIVE MOTOR.

A view of the front or operating side of the machine is shown below, the rear being illustrated above.

Provision is made for operating five boring tools, these being carried in individual carriages which are traversed along the length of the stationary bar, while the work is revolved by two annular chucks which grip it near each end. Each tool head has power feed along the bar, with automatic release and adjustment at right angles to the axis of the bar, this latter movement being controlled by formers shaped to suit the interior contour of the flask.

The main head to which one end of the boring bar is permanently attached, is provided with reversing rapid traverse by power, for the purpose of withdrawing the bar when mounting or removing work from the chucks. The motor for this work is placed on the top of the main head, with belt drive to the gearing through which is also operated the feed screws for traversing the tool carriages along the bar, the outer end of the bar being detachably mounted in a rigid support at the end of the bed.

The two annular chucks which support and revolve the work, are driven by wormgears which encircle the chuck body, the worms shafts being located below the chucks and receiving power from the drive motor through a shaft extending along the back of the bed. This shaft is sufficiently long to allow the chuck heads to be separated for a distance greater than the length of the flask, the main head carrying the bar having previously been moved back to the end of the bed. One end of the flask is now passed through the stationary chuck and the other end supported in the steady rest while the adjustable chuck head is slipped back over the flask to the desired position.



OPERATING SIDE OF TORPEDO FLASK BORING MACHINE.

The withdrawal of the bar necessitates a bed of considerable length; the floor space occupied is 40 ft. long by 8 ft. wide, while the weight of the machine exceeds 70,000 lbs.

ALL METAL POWER HAMMER

THE Beaudry peerless power hammer is suitable for general forging work, but is especially adapted for plating and drawing steel, the manufacture of edge tools, shovel and agricultural implement making, and any forging work requiring extreme quickness of blow. This hammer has no beam, coil springs, leather straps, or rubber cushions, all working parts being of steel.

POWER HAMMER WITH ALL METAL SPRING GEAR

The spring arms extend downwards from the connecting rod, and are embraced at their lower end by two horizontal links, whose adjacent ends overlap so as to clasp the upper end of the ram and hold it suspended. Suitable

nuts on the connecting rod enable the tension of the spring arms to be adjusted so that the amount of sag in the horizontal links can be made more or less to give blows of different degrees of sharpness.

The hammer is started, stopped, and regulated by a foot treadle extending around the base, and any desired speed or force of blow is instantly obtained by varying the pressure on the bar. The idler pulley and brake band are reversible and can be attached to either side of driving pulley through lugs provided for that purpose, so that hammer may be run in either direction to suit requirements.

The frame is a one-piece casting of ample stiffness and forms the ram guides, which are of V-shaped section, and carry a steel ram adjustable on its connecting rod for varying heights above the dies. An adjustable composition taper gib is provided to take up wear on the guides

The spring box, which carries the two spring arms, is of steel, while the spring arms are forged from Swedish steel and carefully tempered.

The arrangement of the anvil enables the hammer to be worked to equal advantage from all sides, the anvil clearing the main frame casting so that bars of any length can be worked either way of the dies.

Beaudry & Co., Inc., Boston, Mass., are the builders of this machine, which is built in seven sizes from 25 lbs. to 200 lbs. weight of ram, 5 in. to 8 in. lift, and 1,200 lbs. to 4,400 lbs. weight.

SMALL GAS-FIRED FURNACES.

TWO new furnaces of interesting design have been placed on the market by Tate Jones & Co., Inc., of Pittsburgh, Pa., to supply the demand for small furnaces for intermitent use, burning either artificial or natural gas. They are designed to heat up quickly and be ready for use in a comparatively short time, the maximum normal period of continuous use not exceeding ten hours.

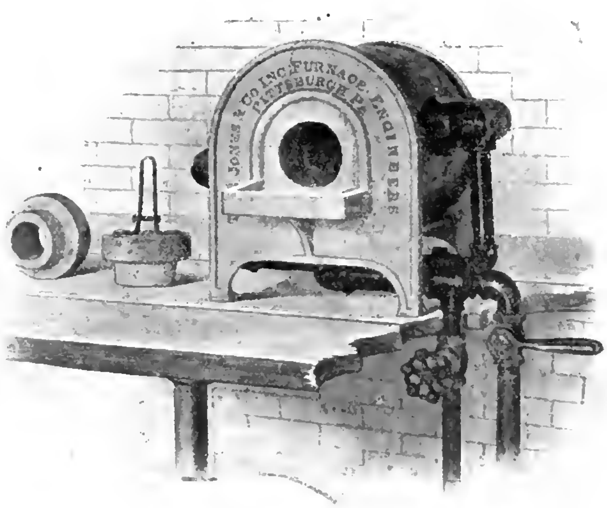


FIG. 1. BENCH FORGE.

The bench forge, Fig. 1, has a circular space extending from the front to the back, suitable plugs being supplied for reducing or closing either end as required. Space is 4 in. dia. x 12 in. long. This apparatus produces a temperature up to 2,300 deg. F., and is specially adapted for cutter hardening, tool dress-

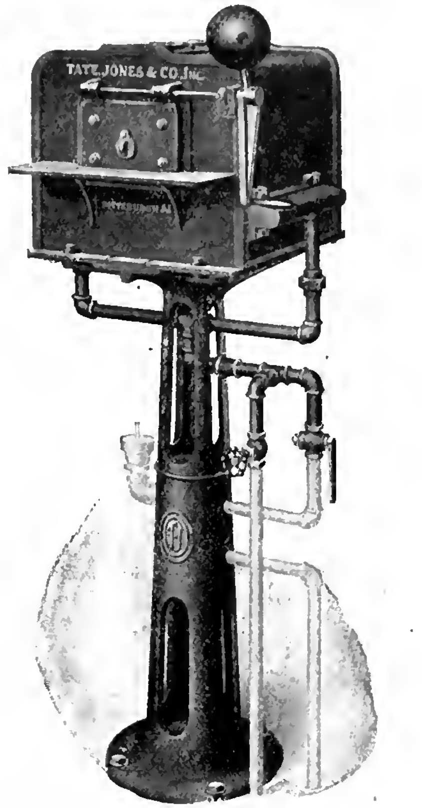


FIG. 2. OVEN FURNACE.

ing, brazing, and local heating on rods or pipes for bending.

The first of series "A" oven furnaces is shown in Fig. 2. These furnaces are made with openings, 6 in. high by 9 in. and 12 in. wide, with lengths of 12 in., 18 in., 24 in. and 30 in. They have flat hearths and are adapted for hardening cutters of all shapes and sizes within their capacity, preheating, annealing and similar work.

The device shown on top of furnace, Fig. 3, is a recuperator which has been developed as the result of considerable research work, and, although adding slightly to the cost, its use has shown

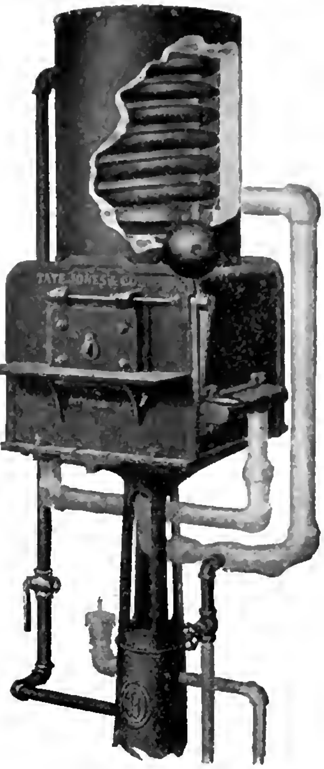


FIG. 3. OVEN FURNACE WITH RECUPERATOR.

very large savings in consumption of fuel.

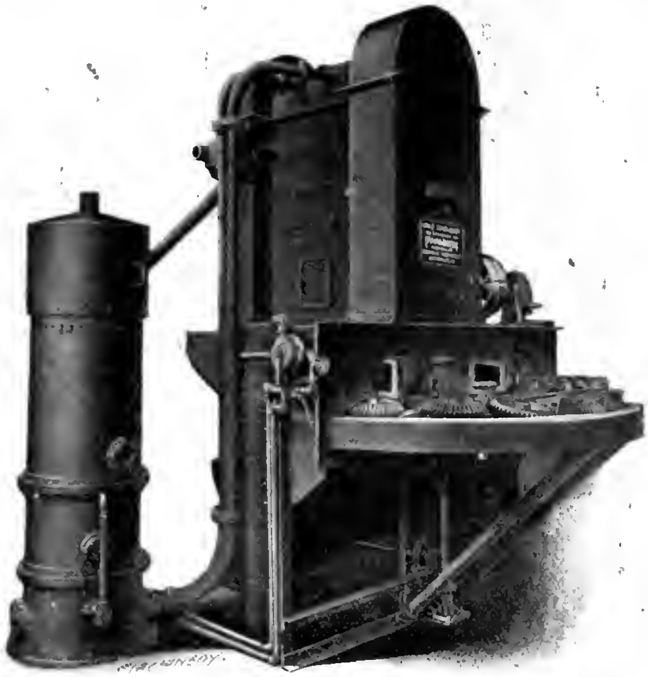
DIRECT HIGH PRESSURE ROTARY TABLE SAND-BLAST

A RECENT product of the Pangborn Corporation, Hagertown, Md., consists of the direct high pressure rotary table sand blast here described and illustrated. This apparatus is built in two sizes — 90-15 and 70-15, for medium and small work, and comprises in its detail a multiple chamber sand-blast, complete rotary table with driving mechanism and housing and belt bucket elevator. The larger machine has two nozzles and the smaller machine one nozzle. The tables the 90 inches and 70 inches diameter respectively and both sizes have the same clearance over the surface of the table. The over-all heights are 12 feet and 9 feet 6 inches respectively.

The equipment is controlled and operated from the front of the machine and the controls are all centralized. The table makes one complete revolution in 5 minutes. With the series of rubber-flap curtains neither dust nor sand comes outside the housing.

The operator starts with a pile of work on the floor or on a truck to his left, and keeps putting a layer of the pieces on the table as it rotates. The nozzles revolve inside the housing and

cover the whole surface of the table. As the pieces come out from under the curtains they are turned over, and when thoroughly sand-blasted, are removed and the vacant space on the table again covered with new work. The sand, after striking the work, falls through the grates of the table to the boot of the elevator, and is returned automatically to the sand-blast.



DIRECT HIGH PRESSURE ROTARY TABLE SAND BLAST.

The refuse is thoroughly separated from the sand each time it is used. With the multiple chamber sand-blast there is no loss of time in refilling the latter. The dust-laden air is exhausted through the openings at the rear of the housing. The rotating of the table and handling of the sand require approximately 4 horse-power. Sand, chilled iron grit, shot, or in fact any abrasive can be successfully and satisfactorily used with this equipment.

NEW ELECTRICAL GRINDERS

THE pedestal grinder shown in Fig. 1 is of compact design, possessing convenience and utility. The integral motor head enables it to be easily moved to any desired location without removing belts or shafts, any accessible lamp socket furnishing current, either alternating or direct.

Two sizes of this machine are marketed by the Standard Electric Tool Co., Cincinnatti, O., the smaller carrying wheels 8 in. X 3/4 in., and having a 1/2 horse-power motor, the larger, of 1 horse-power capacity having wheels 10 in, X 1 in. These tools are suitable for general grinding room work such as castings and tools, and are also adapted for buffing. Ball bearings are employed throughout, being of the double-row, self aligning type, running in grease in dust proof chambers. All insulated motor parts are impregnated with Bakelite reducing all electrical risks to a minimum.

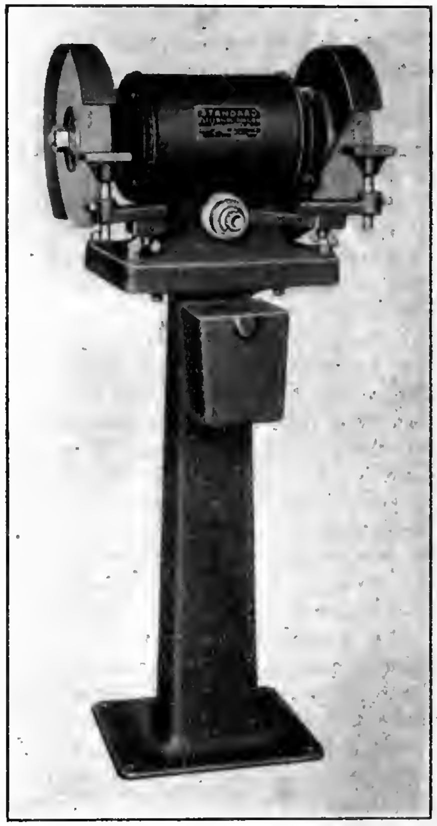


FIG. 1. PEDESTAL GRINDER.

The suspended type of machine, see Fig. 2, known as an Aerial Grinder, is also supplied in 1/2 and 1 horse-power capacities for similar current supply. It is particularly serviceable for grinding rough castings and buffing irregular or bulky work.

The suspension may be from a fixed point, through a spring as illustrated, or it may be suspended on a traveler with a counterbalance. Motor construction and wheel sizes are the same as the corresponding pedestal machines, both styles being designed to work under continuous rigorous conditions.

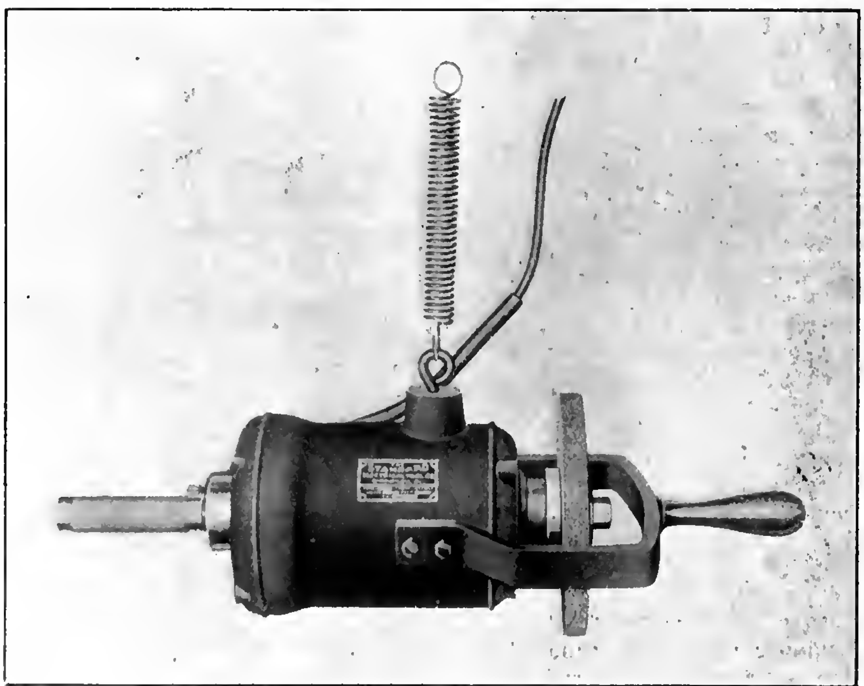


FIG. 2. SUSPENDED TYPE GRINDER.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - General Manager
H. V. TYRRELL - - - - Asst. General Manager
PUBLISHERS OF
CANADIAN MACHINERY
AND MANUFACTURING NEWS
A weekly newspaper devoted to the machinery and manufacturing interests.
PETER BAIN, M.E., Editor.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.
B. G. NEWTON - - - - - Advertising Manager
Office of Publication, 143-153 University Avenue, Toronto, Ont.
Vol. XV. JANUARY 20, 1916 No. 3

WORKMEN'S COMPENSATION LAWS

RECENT years have witnessed a gradual recognition by various authorities in widely separated parts of the world of the duty of the State to the individual and the adoption of Workmen's Compensation Laws has become the rule rather than the exception amongst the leading industrial countries.

Like the majority of innovations affecting the relations of capital and labor, early efforts of legislation in this field were viewed with suspicion by both. Employers were loud in their protests against this addition to their many liabilities, and while the attitude of many firms would have been more sympathetic had the question been a personal one between them and their own employees, the great majority accepting the laws as promulgated, proceeded to carry them out to the letter, and having done their legal share, left it up to the men to do theirs.

Three decades have passed since State Insurance was made compulsory in the German Empire, and fully twenty years ago Britain introduced industrial compensation measures. While a period of some years intervened before the justice of this legislation was recognized by other nations, the economic effect of such measures had meanwhile become fully apparent in the countries of their adoption. Greater care was shown in the selection of new employees, and while cases of undoubted hardship arose through the discharge of some work people as unfit under the new conditions, the ultimate results have quite dispelled the gloomy forebodings which heralded the putting into effect of the legislation. A freshening of industrial effort was the immediate and perhaps the most important result; increased interest and care in the performance of their duties increased the efficiency of most employees; in consequence, the employers' attitude to the law changed gradually from sphinx-like indifference to genuinely human co-operation.

While the working out of all industrial legislation and safety-first movements will ultimately result in the survival of the fittest, such a trend of events must be preceded by earnest effort on the part of each individual to render himself fit. The "greatest good for the greatest number" may well be the motto of all industrial effort, and the continued enactment of protective legislation marks progress toward such a goal.

PLANNING FOR A SHELL-LESS TO-MORROW

FROM quite an authoritative source we learn that Britain's great munitions machine is now fully equipped and running as smoothly as it will be possible to make it. Transforming the country into a huge arsenal in order to win the struggle has been accomplished, and popular opinion as a result is becoming so molded as to evidence a premonition that the end of the war is well in sight. In any case it is significant that steps are being taken to organize for the tackling of the hundred and one problems and adjustments that not only will require solution and tactful management when peace has been procured, but which even now are thrusting themselves forward in volume and importance that may not allow of procrastination.

In Great Britain already, commercial questions are engaging the attention of several influential bodies of manufacturers; the technical development of industries is being looked after by an energetic Government Committee—the Advisory Council for Research; and, last, but not least, the House of Lords has taken in hand the question of the re-employment of returned soldiers.

It is pertinent to ask, where does Canada stand relative to all or any of the foregoing activities? Each of those indicated—there are of course others, should be now in process of development by us, for without doubt to the extent that they are matured will our post-bellum, or earlier, economic and industrial fabric be in a position to meet the new situation. A feverish anxiety is being displayed relative to further shell orders, and, as was to be expected, the Munitions Board which superseded the Shell Committee, is being subjected to more or less severe criticism. The old cry for a Minister of Munitions has again been resurrected, and we should not be surprised but that it will do duty right up to the moment that the Kaiser takes the pen in his trembling hand and admits that his ambitions have been frustrated.

Irrespective of the fact that we have made millions of shells, although not complete in every sense as required —a handicap in a very real sense, we believe, as far as future order-placing is concerned, it should not be forgotten that "The Man Behind the Man Behind the Gun" in Great Britain is one immense munitions producing machine and may, in addition, be reckoned as practically equal now to every war supplies requirement.

We went into the munitions business whole-heartedly and purposeful, without regard for the future, a frame of mind without which we could not have accomplished a tithe of the results that stand to our credit. The time, we believe, has come, however, when the concentration on munitions manufacture may well be less exclusive, and as each succeeding opportunity arises to direct our now highly developed energies into other and war-created channels, no hesitation should be displayed in parting with the old and getting on with new.

In recent weeks it has been our privilege to receive many inquiries—particularly from the managements of small machine shops engaged either in the manufacture of munitions or the equipment required for same, as to suitable lines to develop in lieu of the above when the war demand ceases. With a view to stimulating this highly gratifying development, we are, therefore, having prepared for publication in our January 27 issue, an article dealing directly with products that are eminently suitable for both large and small metal-working plants to manufacture, such products having either been imported previously for our own domestic needs or having since become available to us as an export proposition.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 25	
Ferro nickel pig iron (Soo)	25 00	

	Montreal.	Toronto.
Middlesboro, No. 3	$24 00	.....
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Glengarnock	28 00	.....
Summerlee, No. 1	33 00	.....
Summerlee, No. 3	32 00	.....
Michigan charcoal iron	28 00	.....
Victoria, No. 1	27 00	.....
Victoria, No. 2X	26 00	.....
Victoria, No. 2 plain	26 00	.....
Hamilton, No. 1	23 00	24 00
Hamilton, No. 2	23 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	2.75
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	2.75
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	2.40
Structural shapes	2.50
Plates	2.50

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

BOILER PLATES.

	Montreal	Toronto
Plates, ¼ to ½ in., 100 lb.	$3 00	$2 75
Heads, per 100 lb.	3 10	3 00
Tank plates, 3-16 in.	3 25	3 00

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$15 25	$15 25
Copper, crucible	18 50	18 00
Copper, unch-bled, heavy	17 75	17 60
Copper wire, unch-bled.	17 75	17 00
No. 1 machine compos'n	14 00	13 50
No. 1 compos'n turnings	11 75	11 00
No. 1 wrought iron	11 75	11 00
Heavy melting steel	9 00	10 00
No. 1 machin'y cast iron	14 75	14 00
New brass clippings	11 75	11 50
No. 1 brass turnings	9 75	9 50
Aluminum	30 00	30 00
Heavy lead	5 75	5 75
Tea lead	$ 5 00	$ 4 50
Scrap zinc	13 50	13 00

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect Dec. 14, 1915:

	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
Standard				
¼, ⅜ in.	60	36½	....	....
½ in.	65	45½	....	....
¾ to 1½ in.	70	50½	....	....
2 in	70	50½	66	46½
2½ to 4 in.	70	50½	69	49½
4½, 5, 6 in.	....	....	67	47½
7, 8, 10 in.	....	....	64	42½
X Strong P. E.				
¼, ⅜ in.	53	36½	....	....
½ in.	60	43½	....	....
¾ to 1½ in.	64	47½	....	....
2, 2½, 3 in.	65	48½	....	....
2 in.	....	....	60	43½
2½ to 4 in.	....	....	63	46½
5½, 5, 6 in.	....	....	63	46½
7, 8 in.	....	....	56	37½
XX Strong P. E.				
½ to 2 in.	41	24½	....	....
2½ to 6 in.	....	....	40	23½
7 to 8 in.	....	....	37	18½
Genuine Wrot Iron.				
⅜ in.	54	30½	....	....
½ in.	59	39½	....	....
¾ to 1½ in.	64	44½	....	....
2 in.	64	44½	60	40½
2½, 3 in.	64	44½	63	43½
3½, 4 in.	....	....	63	43½
4½, 5, 6 in.	....	....	60	40½
7, 8 in.	....	....	57	35½

Wrought Nipples.

4 in. and under	75%
4½ in. and larger	70%
4 in. and under, running thread	55%

Standard Couplings.

4 in. and under	57½%
4½ in. and larger	37½%

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto.
Lake copper, carload	$27 50	$27 00
Electrolytic copper	27 50	27 00
Castings, copper	27 00	26 50
Tin	45 50	45 00
Spelter	21 00	20 50
Lead	7 50	7 50
Antimony	45 00	40 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$33 00
Open-hearth billets, Pittsburgh	35 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	42 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 00	$3 05
Cut nails	2 90	3 00
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	3 25	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	65
Stove bolts	75 and 10
Plate washers	40
Machine bolts, ⅜ and less	57½
Machine bolts, 7-16 and over	47½
Blank bolts	47½
Bolt ends	47½
Machine screws, iron, brass	35
Nuts, square, all sizes	3c per lb. off
Nuts, hexagon, all sizes	3¼c per lb. off
Iron rivets	60
Boiler rivets, base, ¾-in. and larger	$4.10
Structural rivets, as above	4.00
Wood screws, flathead, bright	85 p.c. off
Wood screws, flathead, brass	62½ p.c. off
Wood screws, flathead, bronze	57½ p.c. off

LIST PRICES OF W. I. PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong, Sizes Ins.	Extra Strong, Price per ft.	D. Ex. Strong, Size Ins.	D. Ex. Strong, Price per ft.
⅛in	$.05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	....	....
7 in	2.38	7 in	3.81	....	....
8 in	2.50	8 in	4.34	....	....
8 in	2.88	9 in	4.90	....	....
9 in	3.45	10 in	5.48	....	....
10 in.	3.20	....	....	....	....
10 in.	3.50	....	....	....	....
10 in.	4.12	....	....	....	....

COKE AND COAL

Solvay Foundry Coke	$6.50
Connelsville Foundry Coke	5.95
Yough Steam Lump Coal	3.98
Penn. Steam Lump Coal	3.88
Best Slack	3.25

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	25%
At warehouse	15%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS

Solder, half-and-half	0.24½
Putty, 100-lb drums	2.95
Red dry lead, 100-lb. kegs, per cwt.	9.65
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.27½
Benzine, single bbls., per gal.	0.27
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	1.09
Linseed oil, boiled, single bbls.	1.12
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	5.00
Lead Wool, per lb.	0.11
Pure Manila rope	0.16
Transmission rope, Manila	0.20
Drilling cables, Manila	0.17
Lard oil, per gal.	1.10
Union thread cutting oil	0.60
Imperial quenching oil	0.35

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 40%

PROOF COIL CHAIN.

¼ in.	$9.00
5-16 in.	5.90
⅜ in.	4.95
7-16 in.	4.55
½ in.	4.00
9-16 in.	4.20
⅝ in.	4.10
¾ in.	3.95
⅞ in.	3.80
1 inch	3.70

Above quotations are per 100 lbs.

TWIST DRILLS.

	%
Carbon up to 1½ in.	55
Carbon over 1½ in.	25
High Speed	
Blacksmith	55
Bit Stock	60 and 5
Centre drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 50	$3 55
Canada plates, dull, 52 sheets	3 40	3 60
Canada Plates, all bright	4 60	4 75
Apollo brand, 10¾ oz. galvanized	6 00	6 50
Queen's Head, 28 B.W.G.	6 50	6 00
Fleur-de-Lis, 28 B.W.G.	6 00	5 75
Gorbal's Best, No. 28	6 10	6 10
Viking metal, No. 28	5 50	5 25
Colborne Crown, No. 28	5 70	5 80
Premier No. 28, U.S.	5 75	6 25
Premier, 10¾ oz.	6 00	6 50

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$17 00	.....
1¼ in.	17 00	.....
1½ in.	17 00	11 55
1¾ in.	17 00	11 55
2 in.	18 00	11 00
2¼ in.	20 00	12 10
2½ in.	21 00	14 15
3 in.	28 00	14 60
3½ in.	32 00	18 00
4 in.	38 00	23 00

Prices per 100 feet, Montreal and Toronto.

WASTE.

WHITE.	Cents per lb.
XXX Extra	0 13½
Grand	0 12½
X L C R	0 11¾
X Empire	0 10¾
X Press	0 10¾
COLORED.	
Lion	0 08¾
Standard	0 08
Popular	0 07
Keen	0 06
WOOL PACKING.	
Arrow	0 20
Axle	0 14
Anvil	0 10
Anchor	0 08
WASHED WIPERS.	
Select White	0 09
Mixed Colored	0 07
Dark Colored	0 05½

This list subject to trade discount for quantity.

BELTING RUBBER

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble, 40 & 10%	
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$12.75
3-16 in.	8.85
¼ in.	6.15
5-16 in.	4.90
⅜ in.	4.05
7-16 in.	3.85
½ in.	3.75
⅝ in.	3.60
¾ in.	3.60

Prices per 100 lbs.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.06
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy.	.30
Copper sulphate	.15
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	3.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.20
Zinc sulphate	.07

Prices Per Lb. Unless Otherwise Stated.

ANODES

Nickel	.47 to .52
Cobalt	1.75 to 2.00
Copper	.27 to .30
Tin	.45 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs	.4½ to .06
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.04 to .06
Emery composition	.07 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., Jan. 17, 1916.—The industrial situation shows little change from that of the past few weeks, and, while the pressure throughout the various branches of the countries' activities is not so pronounced as a few months ago, an optimistic feeling regarding the future is still predominant. The action of the British Government in placing certain restrictions on the delivery and distribution of the various metals used in the manufacture of war munitions will likely—when definitely decided on—have some effect upon the general markets, both here and abroad. The impression is that with the adoption of these restrictions, prices of the various metals will be influenced, and further advances will result. The recent advances in sheets and bars are partly due to the action of mill managements in granting a wages increase of from 5 to 10 per cent. to their employees. It is anticipated that with the continuance of the present prosperity further wages demands may be made upon employees.

Pig Iron

The market continues strong, but inactive. Furnaces are well sold for present and future delivery, and most dealers are very well covered for the first half-year at prices somewhat lower than at present quoted. Third and fourth-quarter orders are being accepted under contract, but little effort is being made by producers to induce dealers to buy. Production is lighter than shipments in most cases, and stock supplies are gradually being reduced. Local conditions remain unchanged, last week's quotations holding firm.

Steel

Unrestricted production fails to meet the present requirements of the steel situation, and predictions of a higher market are everywhere evident. The heavy export demand will be one of the chief factors in determining future prices, and limitations on European purchases will be controlled by conditions prevailing at the producing mills.

Munition requirements still hold first place on the demands on steel mills and foundries, but many lines of domestic supplies are adding their quota of pressure. Bessemer billets and open-hearth billets at Pittsburg show an advance of \$2 per ton, which makes the week's price \$33 for the former and \$35 for the latter. Forging billets are strong at \$55 per gross ton. Boiler plates have advanced to \$3 per 100 lbs., and 3/16 inch tank plates are now quoted at \$3.25. This is an increase over last week of ¼c per pound.

The demand for blue annealed sheets continues, and it is anticipated that prices will advance before long. Premier No. 28 U. S. gauge is quoted at \$5.75, and 10¾ oz. Premier at \$6, being an increase of ¼c per pound. Galvanized sheets are fairly active, with prices firm.

Lapwelded boiler tubes have advanced approximately 10 per cent., and 2-inch is now listed at \$11; 2¼-inch, \$12.10; 2½-inch, \$14.15; 3-inch, \$14.60; 3½-inch, \$18; 4-inch, \$23.

Metals

The situation in the metal market is at present very uncertain and unsettled. The report that Great Britain has, or soon will place certain restrictions upon the trade, has created much excitement among producers and dealers. What effect this step will have upon the local market is not yet certain, but it is quite obvious that some interesting developments may be expected. At present the situation is not much changed, and little activity is noted. Copper has taken on strength during the week, and also tin and lead, with the other metals comparatively firm.

Copper. — Ever since the outbreak of the war, very little reliable information has been available regarding the complete statistics of the copper situation, either in this country or in the United States. What the actual production of copper has been during the past year or eighteen months is only problematical, and it is the opinion of some dealers that producers are withholding particulars as to their stocks on hand, to justify the high prices being asked. Accurate information showing the present condition of the copper industry would aid materially in putting a stop to speculation.

Contradictory reports from various sources keep the market in a tensive condition; and, while many dealers seem unable to make deliveries before the 1st of June, others are quoting reasonable prices for first quarter shipment. An unconfirmed, yet apparently reliable, report comes from Great Britain to the effect that munition plants can purchase from the Government supplies of copper at £100 per ton, in spite of the fact that the prevailing market price is quoted as high as £114.

Local dealers are asking \$10 per ton above last week's price for lake and electrolytic copper and \$20 for castings, or 27½c a pound for lake and electrolytic and 27c for castings.

Tin.—Owing to the absence of cable reports from the London market (upon which almost all this country's quotations are based) the present situation is in a rather paralyzed condition; and, while little trading is evident, there is a feeling of uncertainty regarding the immediate future. A few inquiries are being received, but little is being done in the way of trading, and will likely continue until the policy of the British Government regarding the retaining of a sufficient supply of metals for national needs has been more clearly defined. The accumulation of excess requirements may have a tendency to increase prices; this would have a corresponding effect upon the local situation. Dealers are quoting 45½c per pound, being an advance of \$1 a ton over last week.

Spelter.—The situation in the spelter market shows little change. While it would appear that producers are pretty well sold for first quarter delivery, there seems to be considerable available supply for early delivery. Sellers, however, are not anxious to accept bids, as the firmer market tends to higher prices. Slight disturbances in the Joplin district have temporarily closed down a large percentage of the mines, and this fact has had its effect. This week's quotations remain firm at 21c.

Lead.—Within the past week much trading has been done, with Europe the heaviest buyer. Many of these purchases will be delivered throughout the year. Local dealers report very good business, and are asking 7½c per pound, an advance of \$5 per ton.

Antimony.—The available supply for early shipment seems to be diminishing, and the present market is very firm. However, the scarcity of inquiries for future indicate a weaker market. Dealers are endeavoring to book advance sales, but buyers do not seem anxious to close. Local prices are steady at 45c.

Aluminum. — The present market shows little activity, but prices are holding firm. Recent restrictions put upon the dealings in aluminum throughout the British market are causing some un-

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion \$100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

easiness. However, the present quotation of 68c remains firm.

Machine Tools and Supplies

Inquiries for heavy lathes are still reported by dealers, while the large shell-producing plants are busy installing machinery. The advent of the shell industry in this country has been the means of developing many new and interesting designs in various machine tools and the knowledge gained during the past year will aid materially in the solution of future problems in machine tool efficiency.

The demand for supplies shows little abatement, the needs of the munition plants being as persistent as ever. Many of the smaller necessities have increased in price due to the advances in the cost of raw material and the scarcity of labor in certain branches.

High-speed steel, cutters, taps and reamers, also files and many of the machine shop accessories, have very materially advanced. Oils and cutting compounds are in great demand, with higher prices being asked.

Old Materials

The consumption of all classes of scrap material is very great. The market is quite active, and dealers are expecting still higher prices. Heavy melting steel has declined three-quarters of a cent, 9c a pound being the present price. Heavy copper and copper wire show an increase of ½c, each being quoted at 17¾c per pound. No. 1 composition turnings have advanced from $11.25 to $11.75 per hundred. Heavy lead is stronger at 5¾c, and tea lead is bringing 5c per pound. Scrap zinc is now quoted at 13½c, being an advance of ½c a pound.

Toronto, Ont., Jan. 18. — The annual reports of the various Canadian banks recently issued, contain much information of an interesting and encouraging nature and reveal a unanimous spirit of optimism. Financial conditions have improved greatly and the outlook generally is much brighter. The steel works and munition plants continue to work at capacity and factories working on war orders are very active.

The extraordinary activity in the steel trade is unabated and the mills are working at maximum capacity. A scarcity of steel is being felt and there is little prospect of any relief in this regard. The machine tool business is quiet but there is a fair demand for tools for making shell parts. Munition plants are now well supplied with equipment so the demand for tools has naturally fallen off. Gasoline consumers will be well advised to watch the market carefully as higher prices are certain. The shortage of crude oil is becoming serious as the demand for gasoline is increasing all the time. Benzine will be affected also. The extraordinary advance in prices of linseed oil is due to the high cost of flax seed, and opinion varies as to when the top of the market is likely to be reached and at what figure. As regards ingot metals, the copper situation is very strong and higher levels are looked for in the trade.

Steel Market.

The mills continue working at top pressure on both domestic and export business. The consumption of steel products is getting ahead of production and deliveries are falling behind with little prospect of any immediate improvement in this respect. The scarcity of steel is increasing and the situation is becoming acute owing to the large tonnage being used for munitions. The market is very firm and prices for all steel products have an upward tendency. Coil chain, cut nails, black and galvanized sheets, bolts and nuts have advanced and higher prices for wrought iron pipe, boiler plates and tubes, wire nails, wire rods, bar iron and steel are are looked for in the near future. The steady advance of prices in the States is affecting the Canadian market. There is no indication of any recession in the American market, so higher prices may be expected here.

The galvanized sheet market is very strong at the recent advance and there is no improvement in the situation. Conditions in the trade are such that many makers of galvanized sheets have withdrawn from the market. Sheet mills are operating at maximum capacity although galvanizing departments of most plants are not producing more than 50 per cent. of normal output. There is a heavy demand for black sheets and deliveries are being deferred anywhere from 8 to 16 weeks. Prices of black and blue annealed sheets are higher. No. 28 gauge black sheets are held at 2.60c, and No. 10 blue annealed sheets are quoted at 2.40c Pittsburgh.

The steel market in the States is strong and prices are very firm but with few changes. The freight congestion in New York is gradually being relieved and it is reported that the railroads may lift the embargo on export shipments shortly. The strikes at the Youngstown iron and steel plants have disturbed the trade as there is a possibility of similar trouble in other districts. The heavy demand for steel bars for export shipment continues and deliveries are deferred from four to seven months. Enquiries for heavy tonnages of steel bars have been received by the mills but deliveries are so backward that few contracts have been closed. Steel bars are quoted at 1.85c Pittsburgh, but near by deliveries are being quoted as high as 2.25c to 2.50c. The market for billets is very strong with a tendency to higher prices. Bessemer and open-hearth billets have advanced, but forging billets are unchanged. Cut wire rods have advanced to $42,00 f.o.b. Pittsburgh.

The ferro-manganese situation has become acute and prices have advanced to $125 per ton at tidewater. Increased difficulties in the transportation of manganese ore from India on account of the posible trouble at the Suez Canal is believed to be the reason for the advance. The British Government has requested all American manufacturers using ferromanganese to dispose of their products containing this material only to Great Britain and her Allies.

Pig Iron

The situation is unchanged. The demand for steel-making pig iron continues heavy. It is reported that the British Government purpose to fix a maximum price on Cleveland pig iron but this market will hardly be affected as none of this iron is being imported at the present time. Prices of Hamilton and Victoria brands are very firm and unchanged.

Old Materials

The scrap copper market is very strong and prices of all grades have advanced 50c to $1 per 100 lbs. No. 1 machine composition and turnings have also advanced as well as brass clippings and turnings. The situation as regards wrought and steel scrap is unchanged, the embargo on the export of these materials being still in force. The lead market is strong and prices of tea and heavy lead are a little higher. Scrap zinc has advanced 50c per 100 lbs. Business is good, the chief demand being for copper scrap.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attaché, Room 904 Flat Iron Building, New York City.

Machine Tools

The demand for machine tools recently has been much lighter and business consequently is not so active as a few months since. Small parts for shells such as primers and fuses, etc., are urgently required as the output of these is considerably less than shell cases, and fixed ammunition only is being shipped to Europe. Makers of shell parts are very busy and there is a fair demand for equipment for turning them out. Deliveries are still backward from plants in the States as machine tool makers are well booked up and labour troubles are also causing serious delay in production. A number of enquiries have been sent out to American machine tool makers but not much business has been closed on account of late deliveries. Canadian machine tool builders are very busy and have as much work on hand as they can conveniently take care of.

Supplies

A fair business is being done in supplies but the demand is lighter than it was. Prices on all lines are very firm and in some cases, advances have to be noted. The linseed oil market is wild and prices have advanced sharply to $1.09 for raw, and $1.12 for boiled oil. The flax seed situation is getting more acute, prices are very high and there is a scarcity of seed. The crude oil market is very firm on account of a scarcity. With the present conditions prevailing there is every prospect of considerably higher prices for gasoline. The demand for gasoline is increasing almost daily and the output of crude oil is decreasing gradually. Imported glues are advancing on account of higher cost of production and abnormal freight rates. Plumbers' oakum has advanced 50c and is now quoted at $5 per 100 lbs. The waste market is strong and higher prices may be announced very shortly. Copper rivets have advanced and are now net list, with list plus 20 per cent. for burrs only.

Metals

The general situation in the metal market is unchanged and price levels are being maintained. The copper market is strong at higher levels but business it little quieter. The tin market at New York is unsettled on account of the difference of opinion in the trade as regards the affect of the British Governments policy to keep a good supply of metal in England. The situation in the lead market resembles that of copper as the British Government evidently intend to regulate quantities sold, and to fix maximum prices. The spelter market is quiet and unchanged while antimony and aluminum are both being quoted at last week's figures.

Copper. — The market is strong and higher. No statistics regarding the copper position are available but it is generally thought that the production is being entirely taken up. There is a very heavy consumption of copper and the position is as strong as ever. Local prices have advanced 1c and copper is being quoted at 27c per pound.

Tin.—The market is firmer with an improvement in London. The New York market is unsettled as there is a difference of opinion in London among the trade there as to the effect of the British Government's policy in retaining a good supply of metal. Quotations are unchanged and nominal at 45c per pound.

Spelter. — The market is firm and prices a little higher. There is a good demand for spot and early deliveries and indications point to higher prices. Spelter has advanced ½c locally and is now quoted at 20½c per pound.

Lead.—The market is dull and prices unchanged. It is reported that the British Government intend to regulate quantities of lead sold and also to fix maximum prices. Local quotations are unchanged at 7½c per pound.

Antimony.—The market is firm and unchanged. There is a scarcity of spot antimony and the future supply appears uncertain. The situation is unchanged and quotations are nominal at 40c per pound.

Aluminum.—The situation is unchanged and the market is holding firm. Supplies are scarce but the demand continues heavy. Local quotations are unchanged at 68c per pound.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

Winnipeg, Man., Jan. 15.—The bright spot on the horizon, as far as the machinery trade is concerned, is an improved demand from the wealthy farmers in the West for equipment of all kinds. The most important feature of this end of the business this year is the small tractor, which appears to be arousing considerable interest among the farmers. It is thought that this type of machine for general use on the farm will now come more into favor. There is a very satisfactory demand just now for small power engines used for crushing, pumping, and for other light work on the farm.

A number of machinery houses in Winnipeg have had a hard time during the past two years, but they all agree that the worst is back of them, and that good times are ahead. However, the machinery business generally continues rather quiet, as there is very little industrial expansion. Apart from orders placed by concerns who have shell contracts, there has been little or no activity in the machinery line during the past year. Whether there is to be an improvement in the demand during 1916 depends upon whether there is any industrial expansion likely to require the installation of new machinery. There are unmistakable signs of improved conditions in trade generally, which will undoubtedly reflect themselves eventually on all branches of business.

Considerable doubt exists as to contracts being placed here for shells. It is known that a contract recently went to Brandon for 20,000 shells, which is helping things out somewhat in that city. The demand still continues good for all kinds of shell machinery, where same can be obtained. The demand for supplies is fair, these being required mostly for saw mills re-opening. There are, however, no new saw mills projected as far as can be learned.

The representative of an Eastern saw manufacturing concern states that, whereas only three or four of the large saw mills were in operation in Manitoba and Saskatchewan last year, he knows of only one this year that will not be operating. The outlook in this line is, therefore, encouraging, as there certainly will be a demand for belting, saws, and other accessories.

HYDRO-ELECTRIC DEVELOPMENT

A CONFERENCE of representatives of Hydro municipalities to approve of the Provincial Hydro-Electric Commission's great development plans for Niagara involving the diversion of Chippewa Creek, will probably be called some time before the Ontario Legislation meets. In order to make a start upon the project, it will, according to Sir Adam Beck, be necessary to secure legislation this ses-

sion. As preliminaries to that will come Government approval and that of the municipal "partners" in the Hydro system. The approval of the Government, which has been taken for granted, will probably be communicated to the commission within the near future.

The endorsation of the municipalities will be given as a matter of course, since the absolute necessity of securing a further supply is recognized. Apart entirely from future consumption by radial railways, the demand of the municipal systems is warrant for pushing the development scheme as rapidly as possible. The commission is already well over the power maximum originally contracted for and paying a higher rate for the additional amount taken from the power companies at the Falls.

GEORGIAN BAY CANAL

IT is a matter for regret that advocates of this scheme should seek to add to the cares of the Government by bringing forward at this time the question of proceeding with this undertaking. While no one is justified in condemning the project as impracticable, the present state of transportation facilities throughout the Dominion justifies the statement that the proposed waterway is economically impossible and financially undesirable. The estimated cost of the entire work is $150,000,000, to be raised by the sale of bonds guaranteed by the Government; failing which the Government could construct it, and meet the cost, as of other public works, with funds from the public treasury. The past history of the Grand Trunk Pacific and the present trials of Canadian Northern will doubtless act as a deterrent to future Government participation in, or encouragement of, such stupendous undertakings.

The question of commercial justification of the Georgian Bay Canal will remain unsettled until it is built and has been in operation for several decades. The great development of the North-West has been made possible by transportation facilities, which in turn have depended on the North-West for a continuance of their existence. The main source of traffic would be the carriage of grain. That, again, would be obtained at the expense of the Transcontinental Railway, and also the enlarged Welland Canal, provided, of course, that the rates were low enough to offer a saving over the expense of the longer trip round the lower lakes. While no such troubles would be experienced as are at present happening in the Panama Canal, the large number of locks would increase the possibility of delay by accidents which are all too frequent in the Welland Canal now, while the greater length of it would cause any tie-up to affect so much more traffic.

One of the arguments advanced in favor of the proposal is the probability of diverting to Canadian channels a portion of the Canadian grain which now reaches the Atlantic via Buffalo and New York. Such diversion could be more completely and permanently accomplished if the estimated cost of the proposed canal were devoted to the improvement of navigation conditions on the St. Lawrence River. The inequality of insurance rates is the principal reason for the preference given the southern route. Remove this handicap from which the St. Lawrence route suffers, and increased shipments would soon result.

If the Georgian Bay Canal were to be constructed and no provision made for equalizing insurance rates, the net results would amount to the saving of a few hours in time. The higher rates and possibility of longer delays might easily offset the time saved over the Lower Lakes route, while the greater certainty of this route would still have many advocates. The interest return on one hundred and fifty million dollars, if applied in the form of insurance rebates, would, with the enlarged Welland Canal, offer sufficient inducement to shippers to keep the grain in the one bottom from Lake Superior to Europe.

Once conditions were equalized, the grain port business would take care of itself. In addition to indefinitely delaying such an event, the Georgian Bay Canal would probably interfere sufficiently with the business of existing waterways to prevent either systems from being efficiently utilized. Better far to have one canal doing business on a healthy basis than two canals struggling for existence at the expense of the country.

CANADA'S TRADE BUOYANT

THAT after fifteen months of war commercial conditions can be said to be in a sound and buoyant condition is the statement made by F. C. T. O'Hara, Deputy Minister of Trade and Commerce, in the annual report of the department just issued.

"It is cheering to note," says the report, "that after fifteen months of war the depression expected by many has not materialized, but, on the contrary, commercial conditions have not only been well maintained, but they can be said now to be in a sound and buoyant condition. In this connection it may be pointed out that the total foreign trade of Canada, excluding coin and bullion, during the twelve months ended October, 1915, amounted to only $1,600,000 less than during the preceding corresponding period. This decrease was due to the great falling off in imports ($92,900,000) and foreign exports ($5,000,000), which was not quite counterbalanced by the splendid expansion in the exports of Canadian produce, which amounted to $96,300,000.

"Statistics of trade during the first seven months of the fiscal year 1915-16 show that commercial conditions are still improving, and seem to justify the most optimistic hopes for the future."

TORONTO CUSTOMS RECEIPTS

THE Customs revenue for the port of Toronto for 1915 totalled $18,901,470, as compared with $16,476,057 in 1914. December, 1915, is not only the largest December so far, but the greatest month for revenue to date. It is the first time Toronto has reached and passed the two-million a month mark. Toronto has had a gain of more than three million in Customs revenue during the past four months.

Comparative figures follow:

	1913.	1914.	1915.
January	$ 1,759,838	$ 1,487,270	$ 1,144,225
February ...	1,827,293	1,532,959	1,387,040
March	1,947,815	1,740,522	1,574,855
April	1,887,289	1,584,895	1,502,797
May	1,767,448	1,462,769	1,485,244
June	1,599,462	1,387,787	1,517,624
July	1,897,489	1,449,422	1,487,829
August	1,853,152	1,684,122	1,611,606
September ..	1,732,528	1,113,865	1,464,342
October .. .	1,656,700	1,086,943	1,668,345
November . .	1,386,976	928,407	1,929,513
December ...	1,397,375	1,017,096	2,128,050
Total	$20,713,365	$16,476,057	$18,901,470

COMMISSION OF CONSERVATION REPORT

THAT the results of the greater production campaign in Canada far exceed even the most sanguine hopes, is the statement made in a report issued on Jan. 7, by the Commission of Conservation.

The idea has generally prevailed that greater production meant an increase only in the wheat crop and other agricultural products, but its effects have been much more far reaching. True, Canada harvested a wheat crop estimated at over 326,000,000 bushels, more than double that of the previous year, and 45 per cent. more than any previous wheat crop in her history. The dairy industry also sent from the port of Montreal butter and cheese valued at $23,705,000, exceeding the exports of 1914, by over $5,000,000.

But the results in other industries were as striking, to quote the report: "In mineral production Canada has made numerous advances. Copper and zinc refining plants have been established at Trail, B.C., and are treating native ores. Improvements have been made in certain steels to enable them to be used for shell purposes. Improvements have also been made in the concentration of molybdenum ores, the mol-

ybdenum being used in the manufacture of big gun linings and high-speed lathe tools. The recovery of benzol from by-product coke ovens has been developed Benzol is used in the manufacture of explosives. In Western Canada the discovery of phosphate of lime in Rocky Mountains Park should prove of great value to the agricultural interests."

The following figures furnish a comparison between the quantities of the different metals used in the manufacture of the 22,000,000 shells for which orders have been placed in Canada, with our production of such metals in 1913:

"Steel used, 400,000 tons. In 1913 it was estimated that the production of iron ore in Canada, 307,634 tons, did not exceed five per cent. of the country's requirements of iron in that year.

"Zinc used contained in brass 11,200,000 pounds. No zinc was refined in Canada in 1913, but the exports of metallic zinc in ore shipped amounted to slightly over 7,000,000 pounds.

"Copper used, 55,000,000 pounds. The total production in 1915 was 77,000,000 pounds, and all of it was exported for refining.

"Lead, 101,760,000 pounds. The production in 1913 was about 37,665,000 pounds, of which over 97 per cent. was recovered as refined lead.

"Canada's fisheries have received especial attention, not only in the production but in the marketing, both on the Atlantic and Pacific Coast advances have been made. Due to conditions brought about by the war, Canada last year placed her fish upon the British market, and it is hoped that some species may be permanently established there."

MARKET FOR COBALT METAL

CANADA is practically the sole producer of cobalt ore; the cobalt content of the ores mined in the Temiskaming district, Ontario, exceeds 2,000,000 lbs. per year. The market for this, at present, depends altogether on its limited use as a blue coloring substance. Hence there is a large accumulation of cobalt oxide at the smelters and at Cobalt.

Under present industrial conditions, the smelters refuse to pay for the cobalt and nickel content, and the miner receives nothing for this valuable constituent of the ore. Yet the metal cobalt resembles nickel in almost all its properties. Its density, malleability, ductility, hardness, tensile strength, and electrical properties are, so far as they are known, very similar to those of nickel. These properties of nickel make it of remarkable industrial value in the composition of a great variety of alloys.

Of these may be mentioned the high-grade steels, where toughness and hardness are desired: for automobile parts, steel tubes, gun steel, cranks and crankshafts, boiler-plates, tires, connecting rods and axles; the nickel-iron wires

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Sarnia, Ont.—The Imperial Oil Co., is completing a large addition to the machine shop.

Hamilton, Ont.—The Burlington Steel Co. will make an addition to their plant, to cost about $5,000.

Dartmouth, N.S.—Contracts are being awarded for the Williston Steel & Foundry Co. new plant.

Chatham, Ont.—The Light Commission has decided to sell some of the equipment at the power plant.

Ottawa, Ont.—The Ottawa Brass Foundry Co. have purchased a property, and will make extensive improvements.

Cornwall, Ont.—In connection with the proposed waterworks system, a boiler plant and pumps will be required.

Montreal, Que.—The Montreal Tramways Co. will increase the capacity of their power plant on Notre Dame Street to 50,000 h.p.

Owen Sound, Ont—The Owen Sound Iron Works which was recently offered for sale will probably remain under the control of local capitalists.

Collingwood, Ont.—The Northern Iron & Steel Co's old plant is being re-fitted and it is expected that the plant will be operating by March. D. I. Kennedy of Owen Sound is interested in the new enterprise.

Electrical

Hensall, Ont.—The ratepayers will vote on a Hydro-Electric by-law on January 24.

Hensall, Ont.—The hydro by-law passed in Zuri h, on Jan. 11, by a vote of 106 for, and 6 against.

Walkerton, Ont.—The Town Council will consider the question of installing a hydro-electric system.

Hamilton, Ont. — The City Council have authorized the installation of a new storage battery signal system at Central Police Station.

Sarnia, Ont. — Preparations are now being made in Petrolea for the construction of a new Hydro line to this city. According to the plans the line will be carried on wooden poles, and will go first to Wyoming, then into Sarnia. It is expected that this city will be using Hydro by the early Summer.

Windsor, Ont.—The Federal Light and Power Co., has at last received a permit from the United States Government to lay cables in the Detroit River for the purpose of transmitting electric current to Detroit and vicinity from Windsor. This is an allied company of the Electric Distributing Co., of Windsor, which has been endeavoring ineffectually for six years to secure this right and has met with every kind of opposition.

Municipal

The Pas, Man.—A telephone system will be installed at an estimated cost of $12,000.

Cooksville, Ont.—The ratepayers are now in favor of adopting the hydro-radial scheme.

Highgate, Ont. — A hydro-electric system will be installed here at an approximate cost of $7,000.

Victoria, B C.—The City Council have received tenders for a proposed bridge, to cost between $300,000 and $400,000.

Calgary, Alta.—The Commissioners are considering an expenditure of $22,500 on equipment for the light and power department.

Hamilton, Ont.—Fire Chief Ten Eyck, in his annual report, urged the purchase of a considerable amount of new equipment, and also recommended that a new alarm system be installed.

General Industrial

Whitby, Ont—A site has been purchased for the proposed silk mill by Mr. Phillips.

Toronto, Ont.—White & Thomas will make an addition to their factory, at a cost of $3,000.

Trenton, Ont.—Early on Jan. 12, fire started in the stock room of the Trenton Cooperage Mills. Damage to stock and property estimated around $1,500.

Sackville, N.B.—Fire on Jan. 10, destroyed the shoe factory owned by A. E. Wry—Standard Ltd. The damage is estimated at $40,000 including machinery with $18,000 insurance.

Toronto, Ont—The Granite Concrete Block Co., and Norwalk Burial Vault Co., have purchased a three acres site on Weston road, close to the Russell Motor Car Factory.

Personal

E. W. Beatty, K.C., general counsel and vice-president of the C. P. R., has been elected to the Board of Directors, in place of David McNicoll, resigned.

Ralph W. Ashcroft, of the Canadian Consolidated Rubber Co., of Montreal, has accepted the appointment of manager of publicity of the United States Rubber Co., of New York.

Alexander Ramsay, head of the firm of A. R. Ramsay & Sons, paint and varnish manufacturers, of Montreal, died there on January 14, aged 76 years.

J. S. Laing, of Essex, recently assistant engineer at Galt, Ont., was named by the Finance Committee of the Town Council as town engineer and assessor for Barrie, Ont., at a salary of $1,200.

Captain T. F. Ahearn, only son of Thomas Ahearn, president of the Ottawa Electric Railway, now with the Canadians in France, has been recalled to Militia Headquarters, Ottawa, to assist in munitions work, in which he has had considerable experience.

Thomas Gibson, president of the Lake Superior Corporation, Sault Ste. Marie, Ont., and head of the legal firm of Gibson & Gibson, of Toronto, has thrown up his business duties to accept a majority in the 168th (Oxford) Overseas Battalion. He is taking a training course at London, Ont.

F. F. Pickard, inspector of hulls for the port of Victoria, B.C., was a passenger aboard the liner Persia when that vessel was sunk in the Mediterranean. He was en route for Mesopotamia, where he was to take charge of machine shops at Basra. Up to the present nothing has been learned of his safety.

J. Kerr Osborne, formerly vice-president of Massey-Harris Co., Toronto, Ont. and for many years conspicuous in the management of a number of large Ontario manufacturing concerns, died on

Jan. 14, at Bournemouth, England. Mr. Osborne was born in Beamsville, Ont., on July 27, 1843. In 1872 he became associated with the Messrs. Harris, and helped to establish in Brantford the firm of A. Harris, Son & Co., in which he became a partner. In 1882 the firm became incorporated under the name of A. Harris, Son & Co., Ltd., of which Mr. Osborne became Vice-president, and held this office until 1892, when the company became merged into the Massey-Harris Co., Ltd.

Trade Gossip

William J. Coates of Halifax, N. S. has opened an electro-plating plant here. Mr. Coates was for many years employed by the Starr Mfg. Co.

Swedish Iron Ore.—Swedish iron ore deposits are estimated at 1,300,000,000 tons. In 1913 6,440,000 tons were exported, mainly to England and Germany.

Sarnia, Ont.—A meeting of the Northern Navigation Co., agents from the different points will be held in this city January 27 to talk over plans and make arrangements for the coming season.

The Canadian Flax Growers' Association at a meeting at Hensall, Ont., on Jan. 11 adopted a resolution asking the Provincial Government to appoint an official to look after the educational interests of the association.

The Canadian Cartridge Co., to-day took out a permit for the erection of another factory building on Sherman avenue north, to cost $15,000. A permit was also granted the Burlington Steel Co., for a factory addition, to cost $4.-800.

Credit Men's Association.—Thos. W. Learie has resigned as secretary-treasurer and manger of the Canadian Credit Men's Association, Toronto, in order to accept a position with W. R. Johnston & Co. A. Stanley Crighton has been appointed as acting manager of the association, while S. E. Stewart has been appointed as acting manager of men's bureau.

Toronto, Ont.—The Board of Control have unanimously approved the suggestion of Mayor Church that a conference be arranged at an early date between representatives of the City Council, Board of Trade, Harbor Commission, Exhibition Board and the District Labor Council to consider the advisability of starting a campaign to increase the number of industries in the city.

Ottawa, Ont.—Col. C. W. Dimick of Boston, Mass., has been in Ottawa for about a week and it is stated on good authority that he is considering several locations for the building of a large plant for the manufacture of rifle powder and dynamite. Col. Dimick was the active spirit in organizing the Standard Explosives, Ltd., and built the plant at Vaudreuil, Que., which was afterwards taken over by the Dominion Explosives Corporation. The new plant, it is understood, will be near Toronto.

Lyons Exhibition Entries.—To facilitate Canadian entries at the Lyons Exhibition, the Hudson Bay Co., have placed at the disposal of the Exporters' Association of Canada 50 tons of free space on a steamer sailing to a French port about January 28th. Free transportation will be granted to those applying to Secretary R. J. Young at Montreal. Arrangements have also been made with the C.P.R. and the Agents- general of all the provinces to utilize all available samples of Canadian products now in London.

Want Farm Boilers Inspected.—The need of placing under provincial inspection during manufacture all boilers used for farming operations was urged upon D. M. Medcalf, chief of the Boiler Inspection Department, recently by a deputation of leading manufacturers. At the present time all boilers used for shops, factories, and other commercial purposes are rigidly inspected during construction, and moreover, must comply with certain uniform specifications laid down by the department, but farm boilers have been left outside.

Iron, Copper and Zinc Ores in 1915.—Iron-ore shipments from the mines of the United States in 1915, according to the usual preliminary estimates of the U. S. Geological Survey, are estimated to have exceeded 55,000,000 gross tons, an increase of more than 38 per cent. over 1914. The pig-iron increase is put at 6,500,000 tons, the output for 1914 having been 23,332,244 tons. The copper mines surpassed all records, the 1915 output having an estimated value of $236,000,000 or $83,000,000 more than the 1914 production. The output of zinc from domestic ores is estimated as larger than ever before, being about 425,-000 tons, worth $120,000,000 as compared with 343,418 tons in 1914.

Tenders

Windsor, Ont.—Tenders will be received until January 31 for heating, ventilating and sheet metal work for the new Windsor Collegiate Institute. Particulars may be obtained from the architect, J. C. Pennington, Windsor, Ont.

Ottawa, Ont.—Tenders, addressed to the Chairman of the Waterworks Committee, will be received up to Monday, January 24th, 1916, for cast iron pipe. Specifications and full information may be obtained on application to the City Engineer's Office.

Toronto, Ont.—Tenders will be received by the Chairman, Board of Control, City Hall, Toronto, up to Tuesday, February 1st, 1916, for the supply and delivery of a number of street cars complete, bodies, trucks, motor equipment, air-brake equipment, copper cables for street car work, and fare boxes. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

New Incorporations

Molybdenum, Ltd., has been incorporated at Ottawa, with a capital of $100,000, to acquire and develop mineral lands, etc. Head office at Montreal, and the incorporators are George Thompson, E. Dery and Roscoe Murphy, all of Montreal.

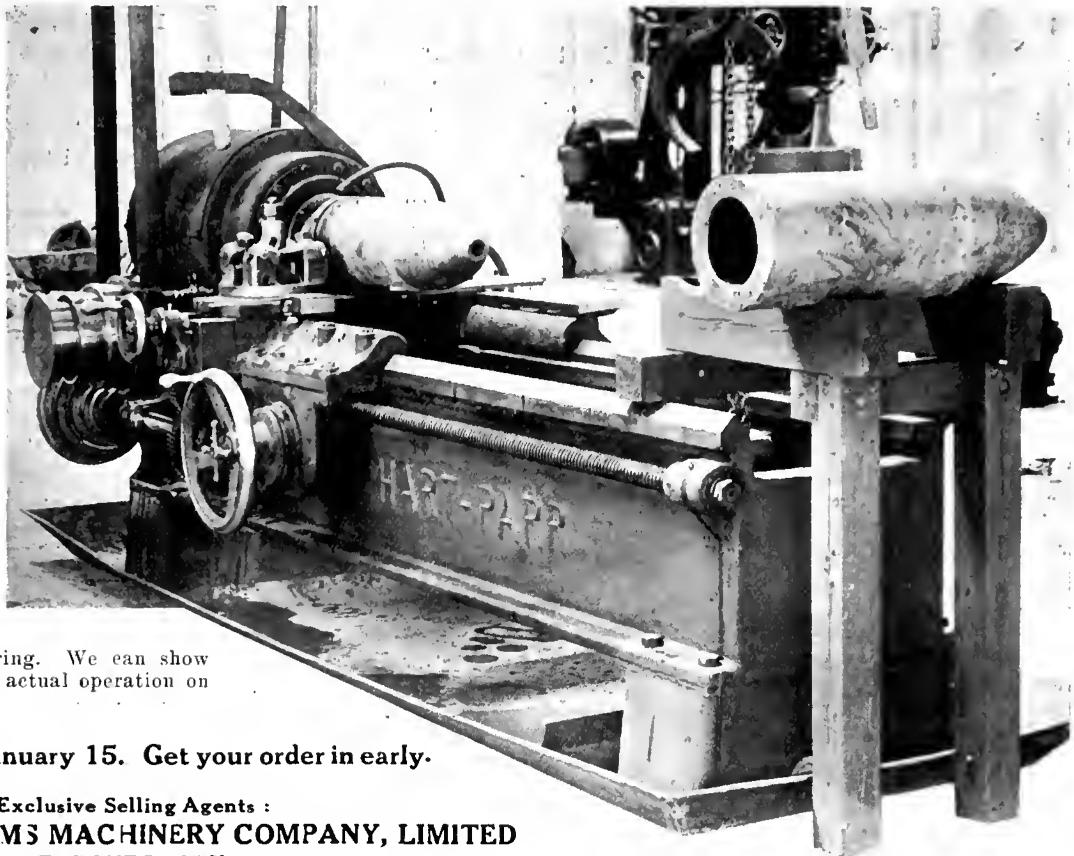
Nobert-Dugre-Arsenault, Ltd., have been incorporated at Ottawa, with a capital of $10,000, to carry on the business of contractors and engineers at Three Rivers, Que. Incorporators: F. X. Nobert, Henry Nobert, and Alphonse Dugre, all of Three Rivers, Que.

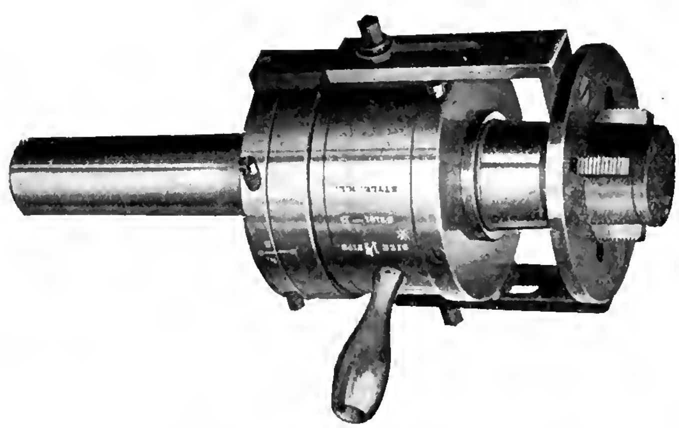
Belgo-Canadian Mines & Timber Lands, Ltd., have been incorporated at Ottawa, with a capital of $40,000, to acquire and develop mining properties. Head office at Montreal, and the incorporators are Gerald J. Barry, Cyrille Laurin and Saul E. Melkman, all of Montreal.

The Laurin and Leitch Engineering & Construction Co. have been incorporated at Ottawa, with a capital of $100,000, to carry on the business of general contractors and engineers. Head office at Montreal, and the incorporators are Arthur Vallee, A. R. Whitney Plimsoll and Reigneur Brodeur, all of Montreal.

The Athabasca Power Co. has been incorporated at Ottawa, with a capital of $100,000, to utilize and develop any of the properties of the company for the production of power. The head office is at Winnipeg, Man., and the incorporators are R. C. McPherson, R. W. Killey and S. L. Goldstine, all of Winnipeg, Man.

Automatic Sprinkler Co. of America, Ltd., has been incorporated at Ottawa, with a capital of $10,000, to manufacture automatic sprinklers and other devices for heating of fire protection. Head office is at Montreal, and the incorporators are Alexander Chase Casgrain, Errold Malcolm McDougall, and Pierre Francois Casgrain, all of Montreal.





Geometric Collapsing Tap, Class "N-L," Equipped with Chasers for Plug Tapping.

Contracts Awarded

Yorkton, Sask.—The Yorkton Creamery Co. have let a contract for a cold storage installation to the Linde Canadian Refrigeration Co., Winnipeg branch.

Hamilton, Ont.—The Canadian Cartridge Co. have awarded the general contract for their new plant to H. G. Christman & Co., of Hamilton.

Hamilton, Ont—The City Council have awarded a contract for a boiler for the city hospital to the Watrous Engine Works, Brantford, Ont., at $1,025.

Building Notes

Toronto, Ont.—Messrs. Long & Co., have decided to build a new four-storey brick warehouse at 727 King street West. The plans have been approved by the City Architect, and the cost is to be $60,000.

Railways—Bridges

Ailsa Craig, Ont—The large steel bridge over the Au Sable River has been completed. Two other bridges will be erected.

Tillsonburg, Ont.—A bridge will be erected over the Ottawa Creek at a cost of about $4,000.

St Thomas, Ont.—Plans have been prepared for a new roundhouse and locomotive shops for the Wabash-Grand Trunk Railroad at St. Thomas to increase the facilities on the line for business from Detroit to Buffalo, and it is expected construction will be started at an early date.

Wood-Working

Buckhorn, Ont.—W. N. Blewitt's saw and planing mill was recently destroyed by fire. The loss is estimated at $4,000, which is partially covered by insurance.

Catalogues

Sand Blast Equipment is the subject of a catalogue being distributed by the American Foundry Equipment Co., New York. The Equipment covered in the catalogue consists chiefly of sand blast tumbling barrels, rotary table sand blast rooms, sand blast cabinets and sand blast outfits. The equipment is fully described and illustrated.

The Diamond Saw and Stamping Works, Buffalo, N.Y., are sending to their friends an attractive wall calendar, 12½ in. by 20 in. The name of the company appears on the top, and also two small engravings of its machines, otherwise the calendar is remarkably free from advertising. The pad is 5 in. x 6 in., and the figures stand out clearly.

Testing Machines.—Catalogue No. 93 superseding No. 76 deals with the Sturke-Watson-Stillman testing machine for cylindrical gas containers. The apparatus and methods of testing cylinders are described in a comprehensive manner followed by a detailed description of the Sturke-Watson-Stillman testing machine with full directions for tests with the results obtained, accompanied by curves and tables. Copies of this catalogue may be obtained from the Watson-Stillman Co., Aldene, Union County, N.J.

Mechanical Rubber Goods made by the Quaker City Rubber Co., Philadelphia, Pa. An interesting and extensive line of mechanical rubber goods including belting, hose for a large variety of purposes, sheet and rod packings, gaskets, valves and tires etc., are described and illustrated in this catalogue. Many of the illustrations are colored giving the catalogue a highly attractive appearance. Several useful tables on belt transmission and pulley diameters are included and the concluding page contains a telegraph cipher code and index.

Grinders.—The Challenge Machine Co., Inc., Philadelphia, Pa., have issued a catalogue, describing a full line of "Challenge" grinders. These grinders are built on the unit plan so that the scope of the machine is limited only by the number of units employed. The class of work for which each unit is best suited is stated and the price is given for each size. Other types of grinder are also illustrated and described as are also emery wheel dressers. A price list of regular wheels is included and formulae are given for calculating speeds.

Chain Hoists—Hoist catalogue No. 7 issued by the Wright Mfg. Co., Lisbon, Ohio, deals with chain hoists, steel trolleys and hand cranes. The essential parts of the hoist are illustrated and described in detail with price list covering all the different parts. A table is included giving particulars and prices of steel hoists of various capacities all of which are illustrated. The catalogue also contains particulars of the "Wright" screw hoist with price list for parts. Plain and geared trolleys are also described with tables of dimensions for the various capacities. The concluding pages are devoted to a description of hand operated traveling crane.

MALLEABLE
GREY IRON
CASTINGS
ALUMINUM
& BRASS

OUR CASTINGS GIVE A MAXIMUM OF GOOD SERVICE BECAUSE THEY ARE MADE AND TREATED ESPECIALLY FOR THE WORK REQUIRED.

MADE IN ALL SIZES.

Castings made on moulding machines are accurate and true to pattern.

IT WILL PAY YOU TO GET ACQUAINTED — SEND A TRIAL ORDER.

The Galt Malleable Iron Co., Limited
GALT, ONTARIO

MORTON MANUFACTURING CO.
PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R.R. SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
SPECIAL LOCOMOTIVE CYLINDER PLANERS
OFFICE AND WORKS: MUSKEGON HEIGHTS U.S.A.

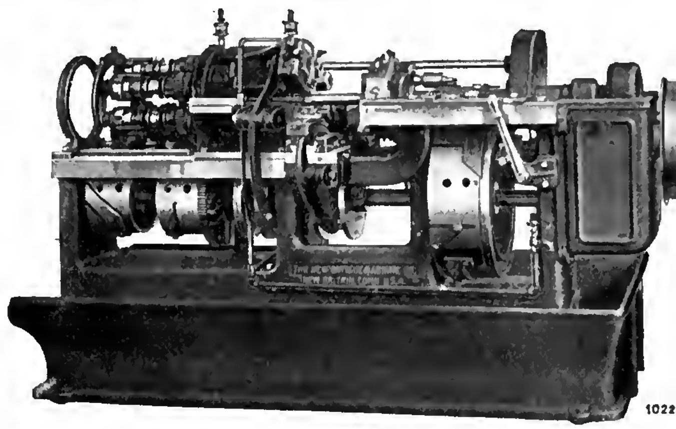
DENNISTEEL
LONDON - CANADA
THE BEST STEEL LOCKERS MADE IN CANADA
MADE BY
THE DENNIS WIRE AND IRON WORKS CO. LIMITED
LONDON, CANADA

This space $1.00 per insertion on yearly order.

Features of

"New Britain" Six-Spindle Automatic

Screw Machines



CAPACITY:

THE SECRET of the NEW BRITAIN'S supremacy lies in its Six Spindles.

SIX SPINDLES provide for the completion of much work which otherwise would require rehandling.

TO BE SURE not every job demands the number of *different* tools it is possible to operate simultaneously on the "NEW BRITAIN." But on simpler work requiring but three or four end operations this extra capacity becomes equally advantageous, enabling the employment of *duplicate* tools for subdividing the longer operations.

THE consequent result is a materially larger production than would be possible on a machine with fewer spindles.

"NEW BRITAIN" Six-Spindle Automatics are built in following capacities:

5/8" x 3¾"
1" x 5"
1⅝" x 7"
2½" x 9"

DESCRIPTIVE BULLETIN UPON REQUEST

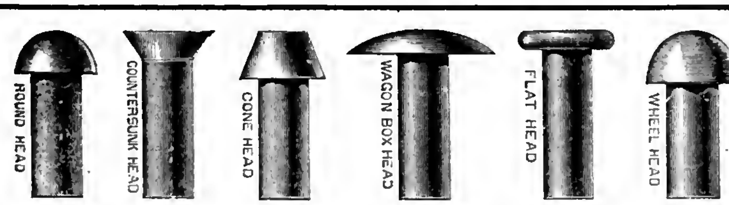
The New Britain Machine Company

Automatic Screw and Chucking Machines
New Britain, Conn., U.S.A.

Dominion Steel Foundry Company, Limited

Hamilton, Ontario

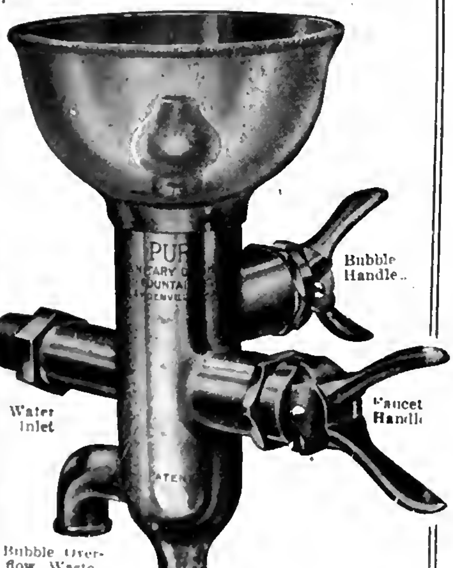
ACID OPEN HEARTH STEEL CASTINGS FOR ALL PURPOSES



WE MANUFACTURE RIVETS of every description, ½ inch. dia. and smaller.

PARMENTER & BULLOCH CO., LTD.
GANANOQUE, ONT.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.



Threading Machinery.—The Landis Machine Co., Waynesboro, Pa., have issued a catalogue No. 22 covering an interesting line of threading machinery for bolts, pipes and nipples, etc., also cutting machines, screw cutting die heads and chaser grinders. The opening pages deal fully with the Landis chaser, chaser holder and rotary die head which are carefully illustrated and their mechanism described. Diagrams and specifications are included in this section. Several different styles of bolt cutters are shown with a specification for each while bolt pointers are treated in the same way. The succeeding pages deal with the pipe and nipple threading machines and chaser grinders specifications being included in all cases. The concluding pages contain a telegraph code for all the lines and accessories, and also some useful mechanical tables on cutting speeds and threads.

Book Review

Altitudes in Canada is the title of book compiled by James White for the Dominion Commission of Conservation, Ottawa. This is the second edition of the book which has been considerably enlarged and the elevations have been thoroughly checked, verified and brought up-to-date. It is the most comprehensive compilation of altitudes in Canada yet published. This introduction contains a lot of interesting information covering levels on the great Lakes and sea-level determinations etc. The book is almost entirely a record of altitudes at practically every railway station in Canada on lines in operation or under construction. There are also a large number of sundry altitudes arranged according to the province in which they are situated. Another series of altitudes covers various points on the St. Lawrence river, the Great Lakes and the Canal Systems. The last section of the book contains several tables giving the water levels for the St. Lawrence river and each of the Great Lakes for each year since 1854 and 1860 according to when the records were first registered. A pocket on the inside back cover holds three interesting profiles of the C.P.R., G.T.P., and C.N.R., transcontinental systems. This is a most useful compilation containing as it does a great deal of valuable information for engineers as well as the general public. The book contains 603 pages, is fully indexed and bound in substantial covers.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV, TORONTO, JANUARY 27, 1916 No. 4

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President H. T. HUNTER, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY

PETER BAIN, M. E., Editor.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

B. G. NEWTON - - - - - Advertising Manager

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—London, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 140 So. Dearborn St., Room 607, Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Making Large Thrust Plates for Ball-Bearing Turntables

Staff Article

Although the comparative accuracy of high-grade machine tools is very great, the fact that such accuracy exists in the tool does not justify an operator in expecting any and every job produced by it to possess corresponding accuracy. That the nature of the material, the size and shape of the job, and subsequent operations to be performed on it determine the degree of accuracy obtainable or desirable in rough machining is shown in following article.

THE thrust plates shown in drawing, Fig. 1, are used in connection with a special design of ball-bearing turn-table. They are of considerable size, and in many respects differ very much from any work of a similar nature previously undertaken by the makers.

Ordinary heavy type thrust bearings of large size are nearly always of considerable thickness, and the manner in which they are assembled allows of considerable variation in the limits of thickness. Consequently, whether made of case-hardened or alloy steel, such thrust plates have not offered any difficulty either in machining, hardening, or grinding.

The production of the plates described herewith was attended by several initial difficulties which in the light of subsequent experience could not have been foreseen. As it was impossible to eliminate the cause of the troubles, attention was given to methods of overcoming them, and satisfactory results were thereby obtained.

Made of Forged Steel

The material specified was forged steel, capable of being tempered to withstand a certain degree of impact without indentation. Under existing market conditions the sources from which such forgings could be obtained were rather limited; arrangements, however, were finally made for the supply of blanks from the American plant of a well-known Sheffield steel maker. The steel contains approximately 0.70 per cent. carbon, with 0.50 to 0.60 per cent. manganese, and when quenched in whale oil at a suitable temperature gives the required hardness without any further treatment.

Preliminary Operations

Machining is done in the usual manner, a rough cut being taken off both sides to relieve all forging strains before machining to finished limits. This work has to be very carefully done, as it is difficult to anneal the plate so thoroughly that all hard spots are removed. After a finishing cut is taken on one side with the plate carefully packed and supported, it is reversed and clamped down on the flat table of the boring mill for the finishing cut on the second side. In spite of this method, high spots would persist, which were of sufficient degree to prevent the accuracy coming within the specified limits. This trouble was further increased by the unavoidable warping which took place in hardening, so that the final work of grinding was fully expected to be quite a proposition.

Previous to hardening, the required boring, drilling and tapping was performed so that when ground the job was complete.

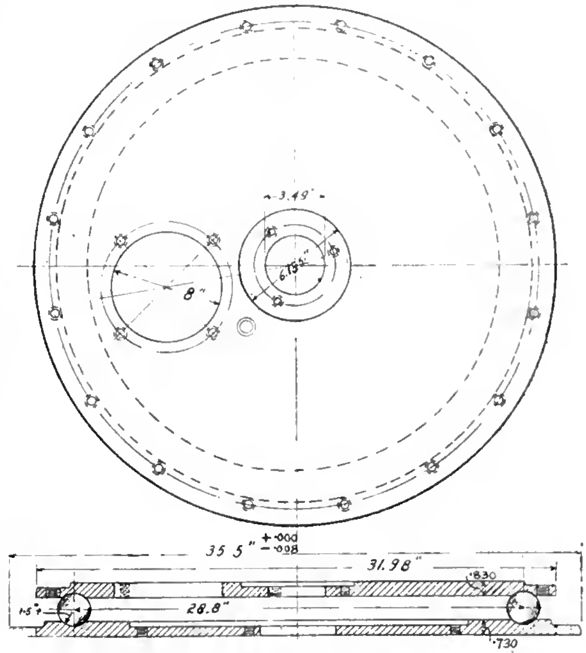


FIG. 1. SECTION OF THRUST PLATES WITH PLAN OF UPPER ONE.

Hardening

The working of hardening and grinding was undertaken by a firm of saw manufacturers, whose facilities were well suited for work of this description. The grinding work done by them did not include the raceways or finishing out the fillets and recesses. They did, however, produce a perfectly plane plate of uniform thickness to the required dimensions.

Heating the plates is done in an oil-fired furnace with a low flat arch, and the oil tank is located immediately in front, so that the plate is quenched with the least possible loss of heat when taken out of the furnace. Great care is taken in raising the plate to a vertical position, as any undue stress may buckle it beyond recovery. The arrangement of furnace, tank, and tackle is shown in sketch Fig. 2. The tilting frame is level with the furnace hearth, and is held in position by a hook while the plate is

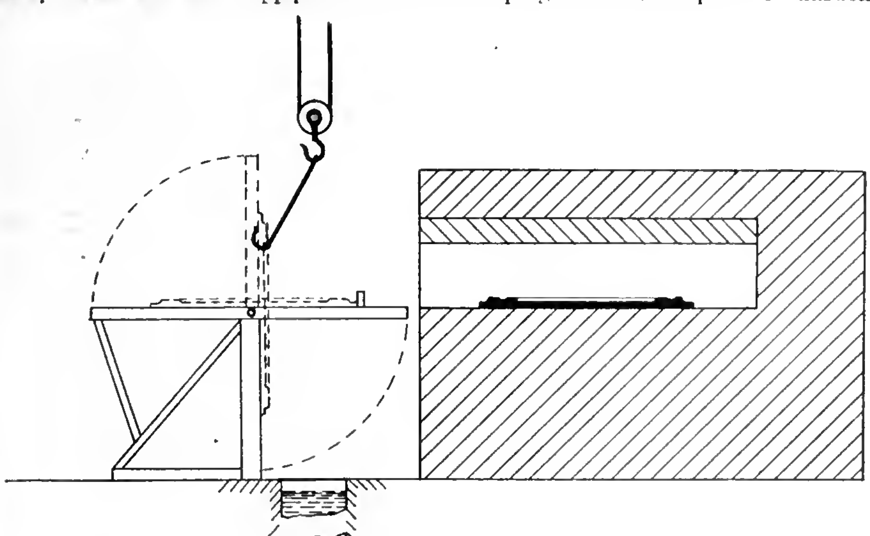


FIG. 2. HARDENING FURNACE WITH TILTING FRAME AND QUENCHING TANK.

being drawn on to the frame. Two stop pins are now placed in holes in the frame so that when tilted towards a vertical position the plate is securely supported while hooks are being slipped through two of the holes in the upper edge.

The plate is then swung clear of the frame and lowered into the oil and agitated till cool, when it is ready for straightening.

Correcting Hardening Troubles

The proper degree of hardness is very necessary so that any excessive warping or bucking may be removed by hammering. This work calls for a high degree of skill possessed by saw makers of long experience, but it was soon found out hammering was limited in its application to these plates, especially the larger one, because the increased thickness at the race-way acted as a stiffener and limited the amount of correction obtainable by hammering.

Warping, on the other hand, was prevented to some extent by this feature, so that after investigation a suitable machining allowance was found, which, with a minimum amount of hammering, produced satisfactory results.

Grinding

There still remained the variations of thickness, due to hard spots in the original forging, and the removal of these in a reasonable time was quite a problem. The first attempts at grinding were made with the existing type of circular saw grinder shown in photograph, Fig. 3. This machine grinds with a large diameter grindstone working on one side of the plate, while a smaller and broader stone running at a much slower rate acts as a support on the other side, and also exerts a braking or retarding effect on the work which enables the large stone to grind away the metal. The plate itself is freely supported on a movable slide, as shown in the picture, the bed on which the slide travels forming a trough of sufficient depth to accommodate the largest saws. This trough is filled with water, into which the work dips as it revolves under the action of the stones.

FIG. 3. SAW GRINDING MACHINE REMOVING EXCESS STOCK ON HARDENED THRUST PLATE.

An Unexpected Difficulty

This machine produced work of uniform thickness, but not perfectly flat, because when any slight warp or twist came around, the whole plate floated with it; consequently, the attainment of a plane surface by this means was impossible.

In the manufacture of saws, this variation is sufficiently corrected by hammering, the thinness and temper of the metal being suited for such treatment. The extreme accuracy, combined with the extra thickness and greater hardness of these thrust plates did not allow this method of correction to yield the desired results, so it was decided to rig up a machine which would allow the use of a regular high abrasive wheel which would enable the high spots to be removed first, after which the greater part of the work was done in the saw grinder and the final grind in the new machine.

Photographs, Figs. 4 and 5, show two views of the arrangement. An old pulley lathe of ample size was fitted with a special chuck mounted on top of the old face plate. A heavy slide with one vee guide was mounted on the bed, and a carriage fitted to it, carrying the grinding wheel and motor. The total weight of cross slide and carriage, exclusive of motor, is about $1\frac{1}{2}$ tons, thus insuring ample rigidity in operation.

FIG. 5. BACK VIEW OF LATHE SHOWING MOTOR DRIVE TO GRINDING HEAD.

The grinding wheel is 16 in. x $1\frac{1}{4}$ in. x $1\frac{1}{2}$ in. hole, and is held between two 10 in. safety flanges. The spindle is exceptionally stiff, having two $3\frac{1}{2}$ in. diameter bearings spaced well apart, and is mounted in a grinding head fitted in flatways and provided with a fine pitch screw for adjustment to or from the work. An extension frame, which is fixed on top of the grinding head, carries a 5-horse power "Lancashire" ball-bearing motor, supported by four adjusting screws, which enable the belt tension to be properly maintained. The use of a high-grade flexible belt, with cemented joint, combined with the even

FIG. 6. GRINDING THE RACEWAYS ON A 54-IN. BORING MILL.

tension, enables a very satisfactory degree of finish to be obtained.

The amount of stock left for finishing

after rough machining is approximately .030 in., of which .020 in. is removed by the grindstone and the remainder by the grinding machine described.

The selection of a suitable wheel was a matter of some experiment, based, of course, on results obtained on previous work. The wheel ultimately adopted was the Carborundum Co.'s "Aloxite," grit 303, grade T, bond D1035.

Grinding the Ball Races.

The grinding of the ball races to the correct radius and depth, the truing up of the periphery, and the grinding of fillets and corners in recesses, are accomplished in a 54-in. Colburn boring mill, as shown in Fig. 6. One of the rams carries a grinding head, with belt drive from a transverse drum behind the cross slide. Formed wheels impart the correct shape to the raceways, while the sharp corners of recesses and the radii of fillets are formed by using suitably-shaped wheels in a swivelling head, shown in sketch, Fig. 7. The regular tool holding head is removed from the ram and the special one fixed in its place. The bracket carrying the spindle bearings is adjustable through a considerable arc. It is mounted between the jaws of a fork piece, as shown, and a series of holes provided for setting at a number of definite angles.

FIG. 4. FRONT VIEW OF PULLEY LATHE USED FOR GRINDING THRUST PLATES.

Testing the Hardness

The hardness testing device is of a special design, which duplicates as far as possible the stresses which are applied to the work in practice. Fig. 8 shows the apparatus, which consists of a small drop hammer weighing 14 lbs., which is allowed to drop through a distance of 12 inches on to the surface of the work. On the under side of the hammer is clamped a $1\frac{1}{4}$ in. hardened steel ball, and the tail of the ball holder projects up through the hammer so that it can be held in the extreme upper position by a small pin arranged to slide through a hole. The hammer is guided by three vertical columns of cold rolled steel, the ends of which are fixed in the upper and lower plates, thus making the device self-contained.

The degree of hardness which just resists indentation by the ball is approximately equal to 60 scleroscope. While this type of machine does not indicate the degree of hardness above the minimum, the possibility of getting the plates too hard is very slight, as the operations are duplicated so closely regarding temperature, etc., that no trouble in this way has been or is likely to be experienced.

TOOL STEEL DEMAND

THE following paragraph relative to the abnormal demand for tool steel appeared in a recent issue of "The Ironmonger":—

"The boom in high-speed and other tool steels which has been in operation during the greater part of the year has lately developed in a sensational fashion. Orders of unprecedented magnitude are literally being flung at the Sheffield, England, makers, and the amount of business rejected by them every week represents a fortune. One order which has just been refused equalled a year's output of the firm to which it was offered. Other makers report that they often turn down in a week requests for supplies which in normal times it would take them two or three years to make. The United States needs high-speed steel so badly that it would be prepared to buy nearly the whole of Sheffield's output. Great quantities are also wanted for Russia, France and Italy, and inquiries are coming from Scandinavia, Holland, Switzerland, Japan, Spain and the British colonies, but no considerable weight of new business can now be accepted in Sheffield, as nearly the whole output is needed at home. Licenses for export are granted only in respect of material the use of which will assist the Allies in maintaining the war. The inflow of orders is so large that few of them are even acknowledged, but some, of special importance, are dealt with jointly by the large firms in part, if not wholly. The possibility of Sheffield appreciably increasing her output of tool steel is remote, owing to the limited supplies of alloys and the limitation of plant for rolling the steel. Several large foreign buyers are now taking the material in billet form".

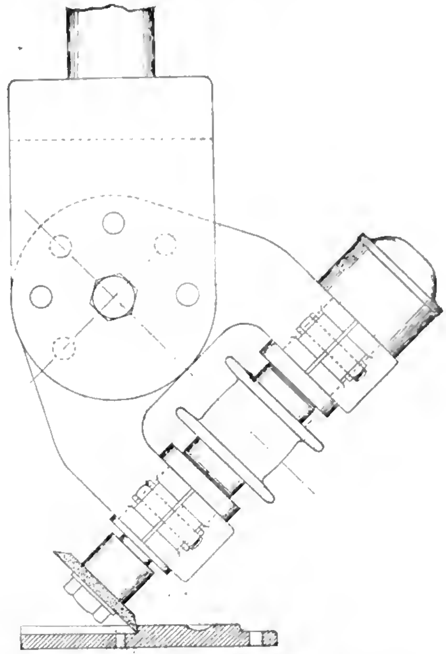


FIG. 7. GRINDING OUT CORNERS OF RECESSES WITH BEVELED WHEEL.

LITTLE KNOWN FACTS ABOUT GRINDING LUBRICANTS

By Howard W. Dunbar.

THE term lubrication may have and does have a number of different meanings, sometimes properly used and sometimes improperly used. Of course, all the running and moving parts on a grinding machine must be properly lubricated,

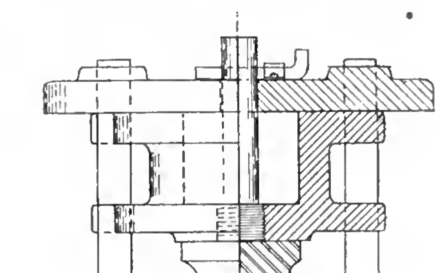


FIG. 8. DROP HAMMER DEVICE FOR TESTING HARDNESS OF PLATES.

but there is one particular practice in grinding which has developed after many years of study and investigation, and

this is known as lubrication of the work. Why do we lubricate anything? Primarily to reduce the friction. Friction on two moving members means heat, and heat means lost power, so in order to reduce the friction, heat and energy, we lubricate moving parts.

The term lubrication of the work may be a misnomer, as the use of grinding compound, oil, soda water or even plain water flowing on the work at the point where the grinding wheel comes in contact with the work being ground, is known as lubrication of the work. It may lubricate in a degree, and reduce the friction of the cutting particles on the wheel, but it also has other functions. It entirely removes the evil brought about by the grinding dust from the ordinary dry grinding operation, as the lubricant carries this dust away as soon as it is made.

It keeps the temperature of the work being ground uniform and even, over the entire surface of the cylinder, and most important of all it carries away the heat generated by the wheel in cutting particles of steel from the cylinder being ground. It dissipates heat, and in this way reduces the power required to grind; permits us to take a deeper cut, and makes it possible to produce large quantities of work, making cylindrical grinding a recognized, commercial machining operation.

Day of Dry Grinding Gone

In the early days of the grinding industry all grinding was dry, but this day has passed. It was considered that the only possibility in grinding was a polishing operation with a dry wheel. This was the conception of engineers thirty years ago. As time went on, a few drops of water per minute were allowed to trickle on the wheel. Improvement was noticed, and then a very small stream was flowed on the wheel. More work was done, and later—to-day—we allow a large stream of compound to flow upon the work at the point where the wheel comes in contact with the work. The results in the productibility of the machine have been astonishing.

Clear water was the first agent tried, and then because of complaints of rust, the soda water was used; the soda in itself being a lubricant, improvement was noticed. Then soapy water was tried, and finally after investigation by chemists, aided by the experience of grinding engineers, compounds have been developed that give the best results. In these compounds there is a certain amount of oil, soda water, soap, etc. They all have their functions to perform, and are successful. No doubt, if one could afford to, greater results might be accomplished if we were to flow clear oil on the work while grinding.

Even to-day we have grinding machines in operation which should be operated as a wet grinding operation instead of dry grinding. There is no reason for factories to grind and snag castings dry, when they should be snagged under a lubricant, and to better advantage, with more economy and greater production. The same is true of the tool room and tool grinding. When grinding dry, very light cuts must be taken, in order that the heat generated will not in any way affect the work being ground.

Primarily, the heat generated in dry grinding causes a certain point on the work to become heated to a greater amount than other points, and since the revolution of the work is so slow as not to allow this point so heated to cool off before it comes in contact with the wheel again, this heat keeps piling up, the work warps, changes it shape by expansion and contraction, and it is impossible, under a heavy cut, to grind anywhere near round or perfect cylinders. This same thing could be true if too little compound flowed on the work. There must be enough to dissipate the heat generated, reduce the friction, and thereby keep the work at a uniform temperature.—Grits and Grinds

WOMEN IN MUNITIONS WORKS

WOMEN have firmly established themselves in several munition works in Sheffield, England, and are proving very successful. A few days ago I had a chat with an official at a firm employing quite a large number of females, says a correspondent of The Engineer, and learnt that this method of filling up vacancies on the smaller lathes and other machines had solved a problem which at one time appeared difficult of solution. Many instances in support of this opinion can be found. In one case of which I happen to be aware, a new shop fitted up with a hundred or so lathes for turning 18-pounder shells was "manned" by youths desirous of being trained as turners for munition purposes. In five months they had made comparatively little progress, and every machine had been broken in some way or another. A few of the more competent, or rather the less incompetent, were retained and the remainder were cleared out, their places being taken by young women. In five weeks they were doing far better work than the youths did after as many months, and of the lathes, which had been repaired or replaced, not one had been damaged. These women—there are about 240 of them in this particular shop, are provided by the firm with khaki overalls and caps, whilst a building adjacent to the works has been converted into a very comfortable dining hall for their accommodation.

WORLD'S LARGEST PLATE MILL

THE largest plate mill in the world is to be constructed by the Lukens Iron & Steel Co., of Coatesville, Pa., U.S.A. The length of the rolls in this mill will be from 200 in. to 204 in., and it will be capable of rolling finished plate about 16 ft. in width. The largest mill in the world at present is at Witkowitz, Hungary, with rolls 178 in. long. This will make the third time in its history that the Lukens Co. has had the largest plate mill in the world. In 1890 it built a mill with rolls 120 in. long, enlarged later to 132 in., which was the argest at that time. In 1902 the company built its present 140 in. mill, which placed it in the lead again, holding this position until the Worth Brothers Co. and later the Otis Steel Co. built mills with rolls 152 in. long.

The contract for the mill has been placed with the United Engineering & Foundry Co., Pittsburg. It will be a four-high mill, of the type used for rolling armour plate in the plant of the Carnegie Steel Co., and will be the first of this kind to be designed for general plate rolling. The two working rolls will be of chilled iron 34 in. in diameter, and the other two of steel, 50 in. in diameter. From the top of the top roll to the bottom of the bottom roll, when all the rolls are set close, will be 168 in., thus presenting a gigantic structure for a plate mill.

THE GRINDING WHEEL TAG

IN many shops too little attention is paid to the wheel tag. A tag is placed on every wheel shipped by manufacturers of grinding wheels to provide the user with a record. This tag contains all the information necessary to re-order, as well as testing and recommend speeds. The record on the tag is an important one and a convenience to the man who orders wheels when the tags are properly taken care of and filed away for future reference. It cannot be too strongly emphasized that preserving the tags and re-ordering according to the order numbers and other records saves time and annoyance on the part both of the customer and the wheel manufacturer, and insures better service.

Notwithstanding the fact that in a few instances it has caused serious trouble, its elimination cannot be considered because it provides the wheel user with such an important and valuable record. The tag is glued to the blotter of the wheel and when torn off sometimes part of the glue is left on the blotter. If the glue happens to be in a location where it comes in contact with the flanges it should be scraped off, otherwise the wheel will run out of true.

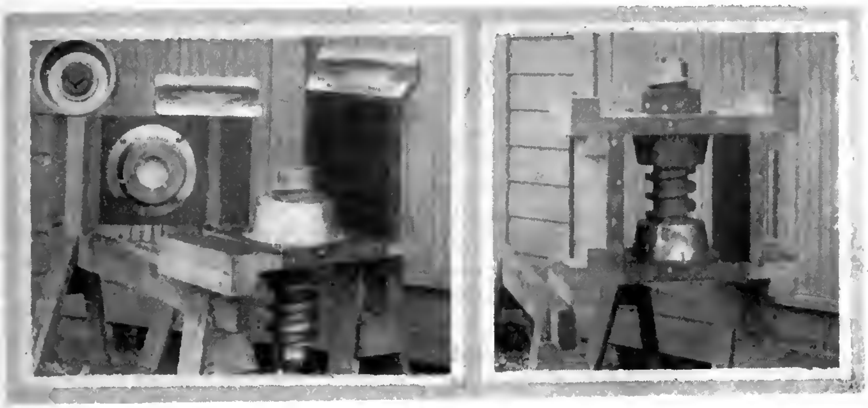
PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

MAKING A CAST STEEL WORM

By D. O. Barrett

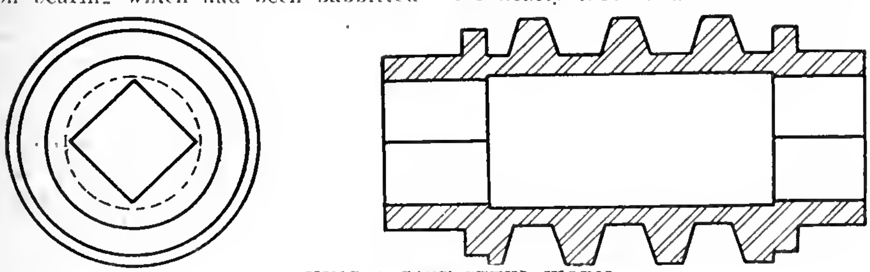
THE worm shown in the drawing was used in bottom dumping coal cars, one at either end, both right and left hand. The worms were 4 13-16 inches in diameter, and 9¼ inches long, and were steel castings cored out as



MAKING A CAST STEEL WORM.

shown. These slipped over a square shaft by means of which they were turned. They were cast in dry sand cores entirely, the core boxes for same being shown in the photo. An assembled view of the core boxes is shown with the worm in position. The box was held together by means of a clamping bolt at each end, and was constructed of oak, and iron bound. The cone-shaped pieces extending into the box at either side were core prints, the core box for which is shown in the upper left hand corner on the dis-assembled box. The box for the square centre core is also shown. There were thus four cores in all.

After the large square core was rammed up, the worm was simply turned out, and the box opened. The worm was provided with an extremely long cast iron bearing which had been babbitted



MAKING A CAST STEEL WORM.

to form a nut. In this manner the action of removing the worm was entirely automatic and there was no danger whatever of crushing the sand.

In order to prevent the feather edge which would otherwise be formed where the thread passed into the nut at one end and the print at the other, a projection was provided in the end core as well as in the main box, so that this was taken care of. These end cores also formed the shroud rings at the ends of the worm. It was, of course, necessary to set the end cores accurately in relation to the main core, and it will be noticed that there is a notch in the upper side of this core for locating same. Two boxes were made, one right and one left hand, and the quality of the work turned out was very satisfactory.

GASOLINE FIRES

by A. R. S.

IN the Jan. 13, issue of Canadian Machinery you answer a question regarding gasoline fires. I should like to add a few words to your answer based on an experience of six years, over a large portion of which time I can safely say that I have seen a gasoline fire twice a month. I have just had one in our factory that was rather bad, as it burned for nearly three hours and there was a tank that contained nearly 5,000 gals. involved. As a general rule I would suggest the following for protection from these fires.

First, I am against the use of ammonia as this bottle might be broken from a small blaze and cause loss of life from breathing the fumes. For a small fire in a can or other receptacle, sawdust is the best thing that can be used. It will float on the liquid and smother the fire where sand or earth will not. Sand will do where there is only a small amount burning on the floor, but, where there is any considerable quantity sawdust is the best. If the fire should spread so that these measures can not be followed, then turn live steam into the room and smother it in that way. The steam will smother it by replacing the air. It is also a good plan to have an asbestos blanket or two around as they also will sometimes smother the fire. Most gasoline fires are caused by the accumulation of vapor, and the room in which it is used should have exhaust fans that will collect this vapor from the floor and also the ceiling. The reason for this is that some days the vapor will rise and at other times it will sink.

WHICH—FIVE CENTS OR FIVE DOLLARS?

By H. W. Benton

FREQUENTLY as we journey through life, we run up against something that seems to be impossible, yet, many impossible things of yesterday are accom-

WHICH—FIVE CENTS OR FIVE DOLLARS.

plished, and almost forgotten to-day in the persistent race to the front. This is true of small things as well as large ones. I once read a statement on the wall of an office which is worth remembering:—"The world moves along so rapidly now-a-days, that, the man who says 'it can't be done,' is frequently interrupted by someone doing it." Let us all aim to keep clear of interruption!

Recently while one of my assistants was inspecting the water end of a duplex pump, he dropped a small wedge down throught the suction valve seat into the suction chamber. It looked like a big job to get that wedge out, for it could not be reached by the hand, or with a long pair of tongs. He made a wire hook and tried to work a slip loop over the end of the wedge, but to no avail. Later he came to me with the statement that the wedge was in the suction chamber of the pump and that the only way to get

it out was to take down the suction line and reach up into the short nipple which was screwed in the pump body.

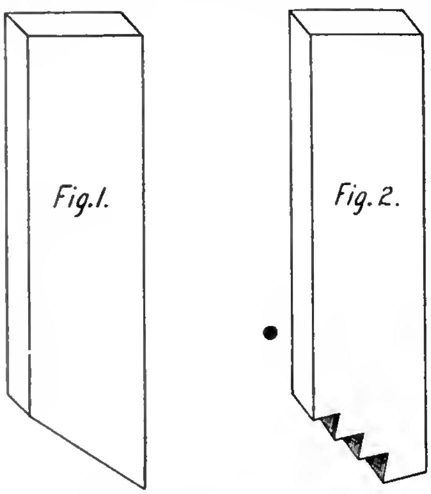
To do this it would have taken some hours on account of the system of piping in connection with the pump.

The wedge was ultimately taken out by the use of the tweezers shown herewith, and without dismantling the piping. These were made of 3-32 inch copper wire; the ends being hammered flat in order to grip the wedge. The tweezers were let down through the valve seat, and placed over the wedge, then by pressing down on the loop wire, they were closed upon the wedge and the latter lifted up to the valve seat where it was easily handled. The job cost about five cents. Taking the pipe line down would cost at least $5.

ONE-PIECE GANG TOOL

By N. G. Near.

IN planing cast iron it is unwise to take too deep a cut with a single-cutting-edge tool on account of the rough corner that results at the end where the cutting tool leaves the surface that is being reduced.



ONE PIECE GANG TOOL.

Breakage to some extent is inevitable. For this reason a gang cutter is a valuable tool to have around; and I succeeded, some time ago, in making one from a ½ in. x 2 in. bar of tool steel that served the purpose very well.

First I annealed the bar and sawed it off on a bevel as indicated in Fig. 1. Then I milled in the notches and ground to shape as shown in Fig. 2, after which I hardened and tempered the cutting edges all at once. With this tool I could take as heavy a cut as the driving belt on an 8 ft. planer would pull.

This was not a satisfactory tool for finishing work, for which a common single edge tool was used, but removes the edge-breaking troubles. After the cutting edges were ground considerably, I had to re-anneal, re-mill, and re-harden and temper as before, but that is not difficult. I find that it makes a good one-piece gang cutter.

CUTTING ODD THREADS

THE following useful suggestion by a correspondent, Mr. Wearing, of Lancaster, appeared in a recent issue of The Engineer:—

When cutting a thread in the lathe of a pitch not a multiple of that of the leading screw, the shop practice is to make a chalk mark on the nose plate and another on the leading screw, then with the saddle brought into a constant position, the screw is put into gear when these two chalk marks occupy the same relative position. As far as my experience goes, it is usual to mark the nose plate on the operating side of the lathe and the leading screw on the top. Then, whenever the leading screw is engaged, these marks must occupy the same positions. The watching of these marks I found very trying to the eyes, especially when running at somewhat high speeds; and I have adopted the following expedient, which I think is new.

In the first place, no matter what pitch is being cut, the leading screw is in a position to engage every (n) revolution, n being an integer. Thus, if on the leading screw a wheel of (x) teeth is mounted, and on a stud carried by a small extension fixed to the banjo plate a wheel with (n x) teeth is mounted, it is clear that the last-named wheel will give a complete revolution between two adjacent points when the leading screw might be thrown into gear, and, thus, if a single line were drawn on this wheel, whenever this was in a constant position, as indicated by, say, a pointer, "the pitch would go in," as turners would express it.

This arrangement, which I have used for cutting the threads of shell base plates, saves the eyes very much, as the index wheel is rotating comparatively slowly, and there is only one point to watch instead of two, and this naturally increases the output. Another advantage is that the arrangement can be fitted to his lathe by any turner.

ROPE TENSION PROBLEM

By "Mechanical Engineer."

REGARDING the question (the January 12 issue of Canadian Machinery) by J. R. H. relative to the strains in the rope (sketch there given), this is a plain case of simple stress, and any elementary treatise on strength of materials will cover the point. First, when any force is applied to a body it tends in a greater or less degree to break it. This would be an external force. There would also be the internal resistance to this force acting in the contrary direction and tending to keep the body together. This force would be the same at any cross section, and in the case under consideration, the stress is the same in both ropes and the same anywhere between the points where the force is applied. If the eyebolt in Fig. 1 were replaced with a spring balance, the balance would register 200 lbs. and not 400 lbs. The same holds good for the eyebolt, as it is exerting a pull of 200 lbs. in the opposite direction to the force A.

INDUSTRIAL EDUCATION BY MOVING PICTURES

By J. H. R.

THE value of moving pictures as a means of education is gradually being impressed upon all classes of society.

When the art of reproducing the actual scenes and movements of life and material upon a screen was in its infancy, the chief thought of the inventor was to entertain and amuse. That the original intention of this invention has been more than realized, must be clearly evident to anyone who has passed a few hours in a moving picture theatre.

The reading of a newspaper and the occasional sight of a certain picture, showing some scene of a notable event or historical pageant is very interesting; but to have the actual scenes pass before one's eyes, leaves a much clearer impression upon the mind, and causes less strain upon the imagination.

One of the features of the movement, which is rapidly attracting interest, is the adoption of the use of moving pictures to the teaching of trades and manufacturing methods. At the January meeting of the Montreal branch of the Canadian Railway Club, a paper, prepared by J. J. Dunn, general superintendent of the Shelby Steel Tube Co., Pittsburg on the "Process of Manufacturing Seamless Steel Tubing," was read by Mr. Chas. R. Barton, of the same company. Following the reading of the paper, the gathering was entertained for over two hours, with moving pictures, showing the methods of manufacture from the cold billet to the finished product; both the welded type process and also the seamless method being clearly and thoroughly depicted. This system of visiting distant plants is only exceeded by personal observation, yet when the opportunity of an actual visit is impossible, no better means of acquiring knowledge has as yet been given to the industrial world.

The moving picture idea of education is to the illustrated method, as the illustrated method is to the mere lecture, and with this in mind, we look for further developments along the lines of industrial education through the medium of the moving picture film.

Opportunities for Canada's Industrial Development--I.

By C.T.R.

In this series of articles prepared in response to numerous inquiries received from the managements of Canadian metal-working plants on the subject of post-bellum employment for their added equipment and enlarged capacity arising from an extended period of shell production, we aim to give prominence to the opportunity to manufacture such products as have previously been imported for our own domestic needs or have since become available to us as an export proposition. The present article is more or less introductory to the series.

THE manner in which industrial efforts should be directed so as to best bring about a resumption and increased scope of pre-bellum activity is a subject which is now occuping the minds of practically all producers in this country. That the decisions arrived at will be numerous and varied there is no doubt, but that they will all be practicable, and being so will also be successful, is a matter regarding which there may be a doubt. From all the numerous viewpoints, however, a broad enough grasp of the situation may be obtained which will admit of the various aspects being summarized and grouped so that the particular features of the situation which apply to any one sphere of industry may be observed by its members, after which it becomes a matter of personal application as to how far they develop the opportunities indicated.

Grabbing Germany's Trade

At the commencement of the war there was much smooth talk and confident assertion regarding the loss of trade which Germany would suffer and the ease with which it would be secured by her enemies. An impartial observer of the war's progress might at the present moment feel inclined to think that the Teutonic powers need not trouble about the loss of their former markets. In spite of the ultimate downfall of the German Empire and its disastrous effects both on herself and her allies, it would be unwise to overlook the fact that a bond of commercial sympathy would remain between Germany and the nations now fighting with her. Such sympathy between brothers in distress would not be lessened by the resultant antipathy to Britain and her allies, and, although the course of years will see a gradual resumption of trade with the Balkan nations in such commodities as tobacco, wheat, maize, currants, etc., the necessary trade balance, which in ordinary times consisted of manufactured goods, will involve gold or securities. Germany, as the greatest manufacturing nation of the Teutonic Alliance, will see that by fair means or foul every possible item of manufactured goods required by these lesser States is purchased from her, and paid for with the gold received from her present enemies.

Such a development, if unconsciously acquiesced in by the Allies, would greatly facilitate Germany's recovery, which will be desirable so far as her ability to pay indemnities is concerned, but it also means a considerable if not a total restriction of Allied exports of machinery and kindred manufactures to most of our present enemies after the war. Most readers will realize that in agricultural implements alone this will represent a serious loss to Canada.

WAR PROFITS

Not all war profits can be footed up in a ledger, this being indicated in the conclusions arrived at by Herbert Corey, war correspondent of a Chicago paper, after extended study and investigation. While the references are particularly addressed to the people of the United States, we in Canada cannot fail to note their equal applicability in our own case.

War has forced us to make use of our own raw resources.

It has made us manufacture things we formerly bought abroad.

It has sent our bankers to other countries to get us trade.

It has taught us to diversify and intensify our crops.

It has opened a thousand avenues for our trade chemists.

It has pushed our goods through doors that once were barred.

It has awakened our manufacturers to export trade possibilities.

It is forcing us to build ships to carry our goods.

It has made us raise our eyes and look at the world.

The question, therefore, of future trade with our present enemies may very well be dismissed as having no bearing on the present situation, which is not "After the war—what?" but "Now—what?"

Metal-working establishments in Canada may, at the present moment, be divided into two groups, viz., munitions plants and manufacturing plants. The former group consists of three classes—first, engineering shops proper, whose entrance into munitions production involved no radical change in the nature of their plant equipment; second, various metal-working plants, such as foundries, bridge and structural works, contractors and others whose machine shop activities were of a special or limited nature, and who practically went into a new line of business when making shells; third, new firms incorporated for the express purpose of handling shell contracts. The latter group, i.e., manufacturing plants, includes all those factories which during the war, have continued in their own line of business. Owing to the non-military nature of their product, many of these have run at a fraction of their capacity, while others whose goods were in demand for army stores have been abnormally busy.

Rebuilding Former Trade

The necessity of accumulating a more than ample reserve of war materials has accounted for the continued activity of certain industries in this country, but economic considerations compel the Allies to conserve their resources, with the result that as their plans mature, and their requirements are more capable of close estimation, they will reduce, as far as consistent with safety, all war expenditure outside of their own borders.

Meantime, while some manufacturers have kept the matter constantly in mind, and have been on the alert for regular business, there are undoubtedly a number who are unwilling to think that the halcyon days of shell contracts will ever cease. No particular sympathy is deserved by such, nor is it likely to be offered.

Granted, then, that people have the means, it becomes a question of ways. Ways might be said to mean time, place, and opportunity, and it is now obvious to many that there is no time like the present. The question of place next arises. The great majority of manufacturers will immediately endeavor to return to known paths, and a little consideration of present conditions may not only strengthen that decision, but in some cases influence them against export trade. Not that export trade is undesirable, but a substantial and well secured

home trade is frequently essential to the successful establishment of a foreign trade.

Assuming, then, that the home market is the most advisable for immediate cultivation, it should not be thought that renewed efforts in this field are simply a return to previous conditions. The three classes of firms in group one have all had their faculties intensified. The third class, at least those of it who have made good, are flushed with success and possess the sinews of commercial warfare. All of these classes are better equipped than ever before, and with many of them the desire for continued activity has become almost an obsession.

Opportunities Here

The prospects of activity in developing the Dominion receive considerable encouragement from a study of similar past phases in the history of other countries. The Department of Trade and Commerce in Weekly Report, No. 572, January, 1915, published a statement of the principal articles imported from the United States during the year ending March 31, 1914. Although the consideration of German trade forms part of this discussion, an immediate attack on such trade with foreign countries does not offer the quick returns which can be had by supplanting imports from Germany to this country with articles of home manufacture, and the same reasoning applies more particularly to imports from the United States. Not only in quantity and quality, but in nature, design, material, and nearly every physical characteristic, the United States products are much more part of our everyday existence than were the German goods.

Our facilities and, if one may judge by munitions production, our resourcefulness, are at least equal to that of our Southern neighbors, and with certain exceptions, such as coal, iron ore, and other materials controlled by nature, there are few products of their factories but what can be duplicated here. The subject of Made-in-Canada opportunities is dealt with in the report referred to, which points out that the present time is a turning point in the life of the Dominion. The theory of cyclical development of civilization is considerably strengthened by the facts quoted in regard to the early stages of commercial activity in the United States, and, at a later date, Japan.

History Repeats Itself

"An analogy is frequently drawn between the economic development of the United States and that which is at present going on in Canada. It is pointed out that whereas manufactured goods in 1870 accounted for about 40 per cent. of the total imports into the United States, in 1912 they formed less than 22 per cent. Similarly the economic transformation of Japan may be instanced. In the thirty years from 1882 to 1911 the percentage of manufactures to total imports into Japan decreased from 42 to 24 per cent., while that of imports of raw materials increased from 4 to 45 per cent. It is, therefore, inferred that a somewhat similar development will take place in Canada in the near future.

It may be pointed out, however, that while the United States in the first half of the nineteenth century was a country importing manufactured goods from across the sea prior to the development of her own industrial resources, Canada at the present time makes up the deficiency in her home production by importing to a large extent from a country contiguous in territory, similar in economic resources, and of a high industrial development. On the other hand, Canadian manufacturers have the advantage of being able to profit from the skill and experience of producers in the United States, as well as the advantage of a valuable and intelligent home market. There is, therefore, every reason to look for a substantial future increase in the consumption of home-made goods and a consequent decrease in the proportion of manufactured imports.

It is natural to expect that in this increase in the consumption of "Made-in-Canada" goods, Canadian producers will follow the lines of least resistance and direct their efforts to the manufacture of those articles for which the natural resources of the country are most fitted. In so doing they come into competition with the longer-established and highly-developed industries of the United States."

B.C. NEEDS COPPER REFINERY

THE HON. LORNE CAMPBELL, Minister of Mines for British Columbia, recently outlined some ideas which he holds respecting what should be the policy of the Mines Department at this time. He laid stress on the necessity of the erection at some point on the coast, at as early a date as possible, of a copper refining plant.

Mr. Campbell explained that at present nearly all the raw material produced in this province is shipped to refineries in New Jersey. The blister copper from the Granby smelter at Anyox, for instance, is shipped overland to New York, to be refined further in American plants. Concentrates from the Britannia mines, Howe Sound, mostly go to the Tacoma smelter, whose product also finds its way to New York markets.

The minister believes that a plant established at a suitable place on the Coast could handle this business and ship its product direct to the order of the British Government for manufacture in Great Britain. There is no present intention of bonusing a refinery, but the Government is collecting all possible data on the matter with the idea of furthering the project of the establishment of such an institution at some point on the Coast.

Mr. Campbell added that the present activity in the mining industry in this province is rapidly developing to a point which will admit of no delay in pushing forward such projects as he mentions. The returns of the last week's business just to hand, show big increases in the ore shipments from the Boundary and Kootenay mining district. A total of 19,300 tons of ore, chiefly copper and silver-lead, was moved last week, as compared with 8,800 tons for the corresponding period last year. The returns indicate an increasing ratio each week.

FILTER FOR PURIFYING CUTTING OILS AND COMPOUNDS

ON account of the great increase in the use of automatic machine tools, the higher speeds at which they are operated, the necessity of greater accuracy and exact duplication of parts, and the increased cost of labor and raw material, manufacturers have had forced upon them the fact that present methods of using cutting oils and compounds on machine tools are inefficient and far from the high standards of efficiency maintained in other parts of the plant. It is indeed surprising that the old method of using the same cutting oil or compound over and over again, without purification, is still being used in some of the best operated shops. Even where attempts are made to purify the cutting oil or compound it is generally carried around in buckets and poured through inefficient filters not designed or suited for the filtration of this kind of oil, and the expense and waste incurred in handling cutting oil in this manner usually offsets its advantages.

There is no reason why methods of handling cutting oil should not be brought up to the present scientific and efficient basis of the modern automatic oiling and filtering systems used on power plant machinery. Power plant oiling and filtering systems have entirely supplanted the old fashion hand and oil cup method of lubrication in all efficiently operated power plants, and, in a like manner, automatic filtering and circulating systems for handling cutting oil are rapidly superseding all other methods. The advantages of this system are more fully pointed out below, but the most important feature is that it usually pays for itself in less than a year. In its simplest form, a modern cutting oil circulating and filtering system operates as follows:

Clean cutting oil or compound flows from an overhead reservoir by gravity

through a system of piping to the various machine tools, affording lubrication not only to the cutting tools themselves but also to the different bearings on the machine. The oil supplied through a flexible metal hose to each machine is regulated by a valve at the latter. The used oil from the various machines drains by gravity into a filter where it is thoroughly purified. The filter is designed so that it removes all scale, sand, metallic chips, etc., and when necessary the oil is sterilized so that it will be free from bacteria.

The use of pure cutting oil undoubtedly pays. It was found in one plant that the cutting tools and drills lasted from one-third to two and a half times longer when lubricated with clean cutting oil than when dirty oil containing metallic dust and scale was used.

In another plant difficulty was experienced because the foreign matter in the oil caused the sides of the drills to wear down making them tapering and causing them to wedge. This in turn generated more heat, interfered with the accuracy of the operation and consumed more power. By using clean cutting oil this difficulty was eliminated.

In another plant working on cast iron, the sand and scale in the oil quickly wore down the sharp cutting edges of the dies and taps, making it necessary to frequently sharpen them. The use of clean, filtered oil kept the tools sharp a much longer time and greatly decreased the power consumption of the machine.

In another plant a large amount of time was lost, because the sediment in the cutting oil interfered greatly with the operation of the self-opening dies, causing them to stick. Using filtered oil eliminated this trouble entirely and greatly increased the output per machine and per operator.

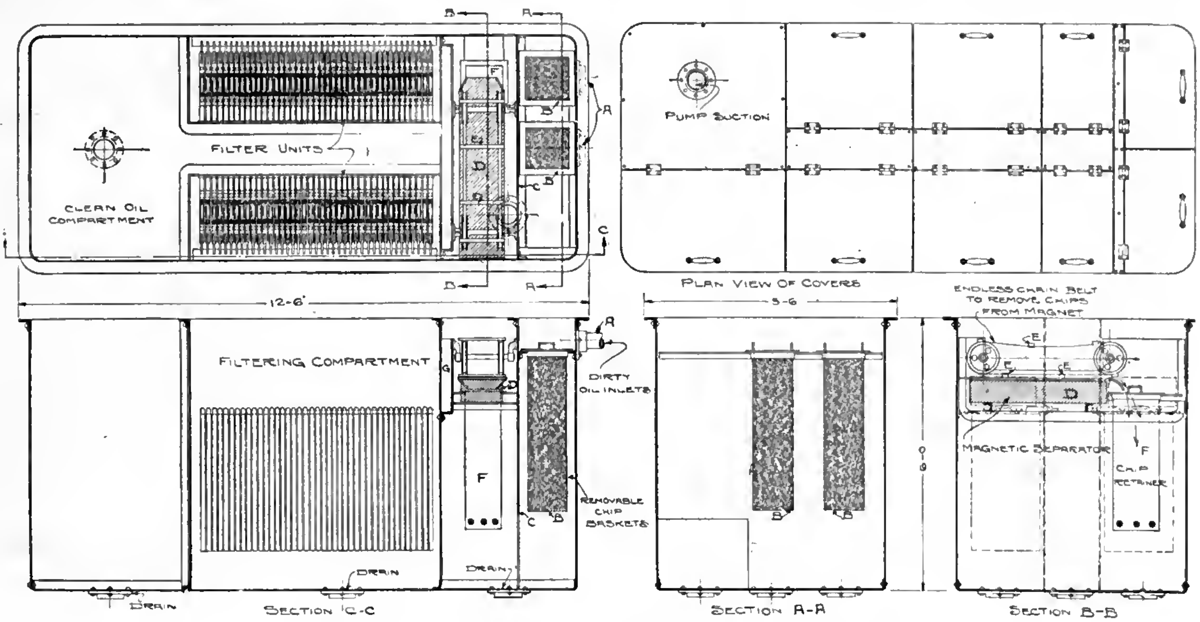
A cutting oil system pays for itself in the reduction of the fire hazard. The disadvantages and danger of having large bodies of cutting oil around a plant are apparent. This hazard is practically eliminated where an automatic circulating system is installed as the oil fed to the various machines instantly passes off into the drain pipe. No oil is kept in the base of the machine and the small quantity adhering to the machines and cuttings is not sufficient to support a fire. The oil storage reservoir and filter can, if desired, be located away from the main building or in a fire proof compartment.

Practically every manufacturer realizes the advantages of using a good oil on machine tools. The matter of expense is not so important when an automatic circulating and filtering system is installed, because the cutting oil really becomes an investment and is used over and over again. The value of using good, clean oil for lubricating the bearings on the tool is obvious.

The Richardson-Phoenix Co., of Milwaukee, Wis., has recently brought out a line of filters designed especially for purifying cutting oils. The illustration shows one of their Peterson type cutting oil filters equipped with a magnetic separator for use on plants working on cast iron or steel. The operation of this filter is as follows:—

Used oil enters the inlets A, passes down through strainer baskets B, which remove large cuttings, flows under baffle C, then up and across the top of the magetic separator D, where iron or steel chips are removed. To remove the accumulation of chips, scrapers E-E, operated by an endless chain belt, travel across the face of the magnet, scraping the chips off into the chip retainer F, which is provided with holes in the bottom, covered by screens, to allow the oil to drain out. Referring to section BB, this chip retainer can be slid to the right and lifted out. After passing over the magnet, the oil flows over dam G, into the the filtering compartment, completesurrounding and flowing through the individual filtering units, where the most minute particles of foreign matter are thoroughly removed. The clean oil collects in the clean oil compartment H, from which it is elevated, by means of a pump, to the overhead reservoir, ready for re-use; or if the use of an overhead reservoir is objectionable, the clean oil can be pumped directly into the oil distributing piping which is equipped with a relief valve to maintain the requisite pressure.

The Peterson cutting filter is built in a number of different designs to meet local conditions and for different kinds of oils. A battery of filters, capable of handling 50,000 gallons of cutting oil per hour is, we understand, now being built for a large machine shop.



FILTER FOR PURIFYING CUTTING OILS AND COMPOUNDS

C. P. R. and New Construction.—Grant Hall, vice-president and general manager of the C. P. R. Western Lines, says that in view of the financial outlook it has not been decided to proceed with the building of any new lines, but this matter will be given further consideration in the spring. There is no possibility of embarking on any ambitious scheme during the war, but over 150 miles of track will be relaid with heavy rails, and there will be a considerable expenditure on ballasting, bank widening, etc.

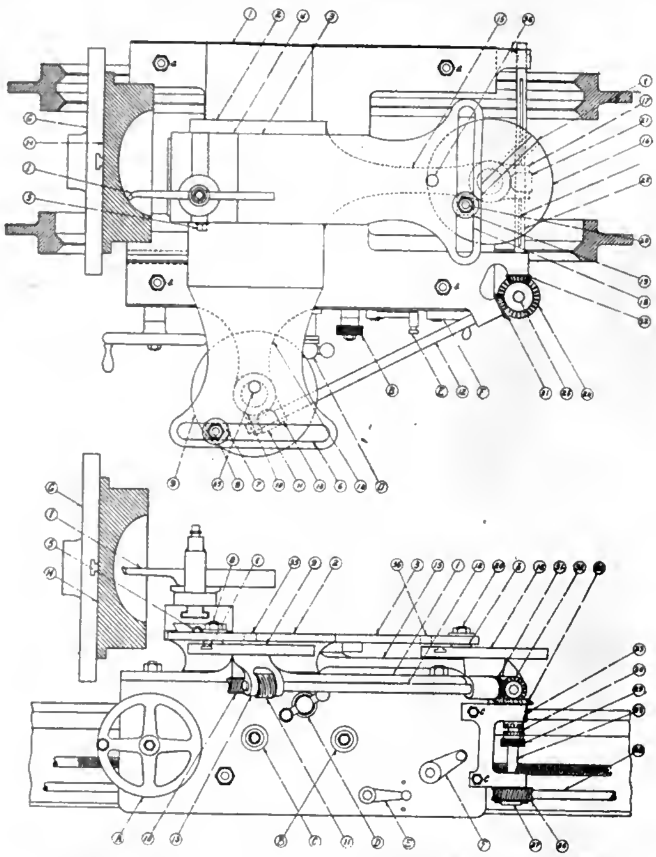
EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

DEVICE FOR IRREGULAR TURNING

By J. H. R.

THE accompanying drawings illustrate a device that may be placed on a lathe, boring-mill, milling machine, planer or shaper with slight changes to suit the various machines. Figs. 1 and 2 show the device placed on the saddle of a lathe and boring an elliptical cup shaped die. The principle upon which the attachment operates is employed in geometry to draw an exact ellipse, the cutting tool making the required outline while the work is in motion.



FIGS. 1 AND 2.—DEVICE FOR IRREGULAR TURNING

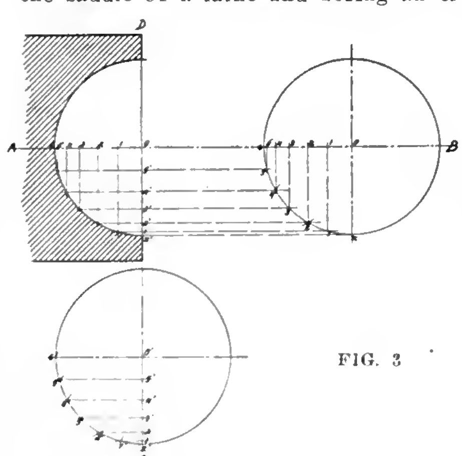


FIG. 3

As shown in Figs. 1 and 2, the compound rest is removed from the saddle and the device placed on and secured by the bolts a, a, a, a. The base (1) carries a slide (2) at right angles to the lathe spindle. The slide (3) moves at right angle to slide (2) and parallel to the lathe spindle. The auxiliary slide (4) which carries the tool post is for adjustment of the cutting tool.

On the outer end of the slide (2) is a parallel slot (6), in which travels the sliding block (7), controlled in its movement by its position in the tee-slot (t) in the disc plate (9). This disc plate, shaft and worm-wheel (10) are supported in the arm extending out from the base 1. The disc 9 and worm-wheel 10 are revolved by the worm 11 secured to the shaft 12, which carries the bevel gear 31. This gear is driven by another bevel gear 24, which is secured to the vertical shaft 25 driven by the worm-wheel 26, and worm 27, which is feathered to the feed shaft 28, and held in position by a fork upon the bracket 23, which carries the shaft 25, and is secured to the apron by the screws C, C.

A similar arrangement is placed at the outer end of the slide 3, with the exception that as the disc plate 16 and its shaft are carried in the extending arm 15 from piece 2, which necessarily must have a lateral movement. The worm 21 is feathered to the shaft 22, which is carried in the brackets upon the brace 1. This shaft derives its motion similar to the shaft 12.

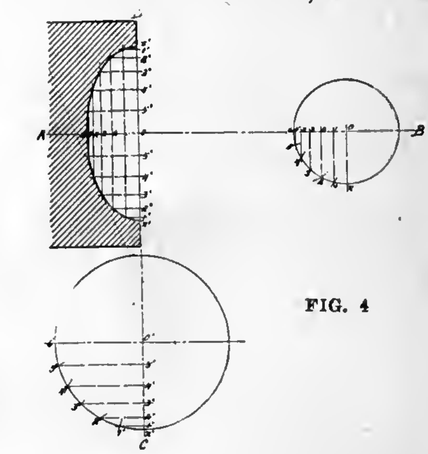


FIG. 4

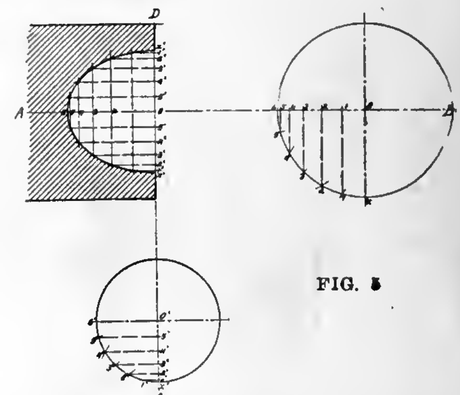


FIG. 5

It will readily be seen that with the crank pins 8 and 20 placed at different distances from their centre of motion, and started from different positions in-

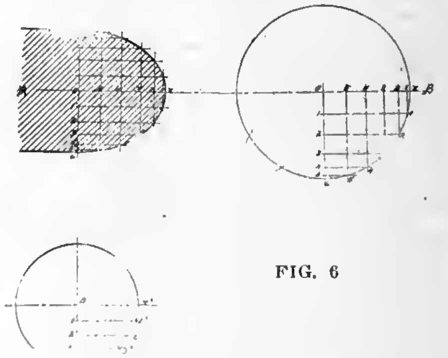


FIG. 6

numeral shapes can be produced. Take for an illustration, the elliptical bowl-shaped die as shown. It must be understood that the plan of this die is circular, but the cross section as shown is an ellipse.

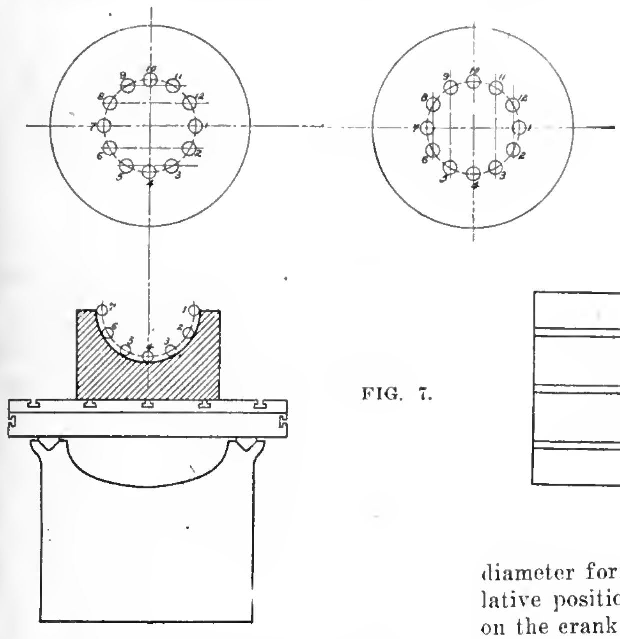


FIG. 7.

The diameter at the mouth of the bowl is to be 12 inches, and the depth 5 inches, and the cross section to be a true ellipse. The diameter or major axis of the ellipse is derived from the cross feed of the cutting tool, therefore, the crank pin 8 must be placed 6 inches from its centre of motion; and, as the depth or minor axis is derived from the traverse motion, the crank pin 20 must

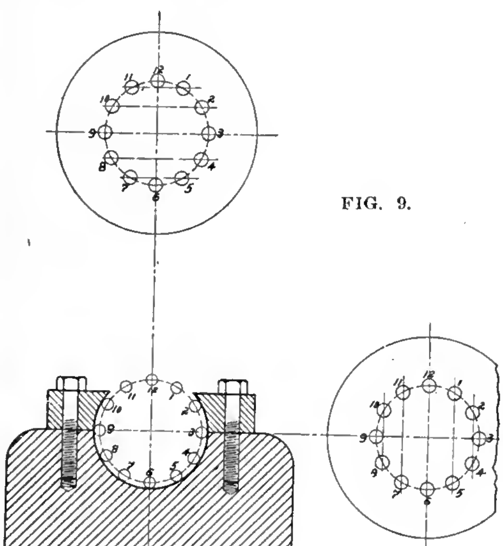


FIG. 9.

be placed 5 inches from its centre of motion. Now, with each crank upon the quarter and the tool in position, the lathe is ready to start by engaging the feed by means of the knurled clutch collar 29.

Fig. 3 shows a skeleton sketch of the relative positions of the two cranks when turning a semi-circular bowl.

Fig. 4 shows a skeleton sketch of the relative positions of the two cranks when turning an elliptical shape, the diameter being the major axis.

Figs. 5 and 6 show the internal and external of an elliptical shape when the

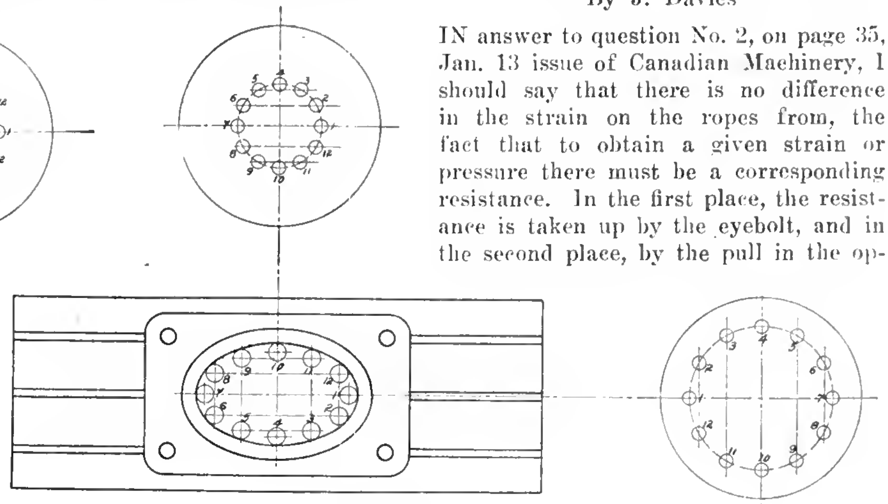


FIG. 8.

diameter forms the minor axis. The relative position of the cranks are shown on the crank circle by the use of similar figures.

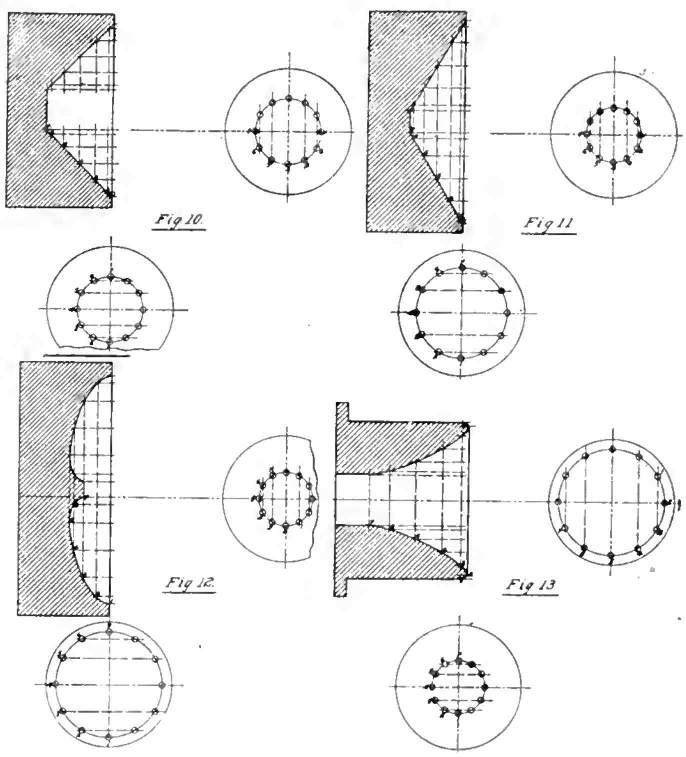


Fig 10. Fig 11 Fig 12. Fig 13

DIAGRAMMATIC FEATURES OF IRREGULAR TURNING DEVICE

Fig. 7 shows a skeleton sketch of the device as operated upon a planer or shaper; Fig. 8 as operated on a vertical milling machine, and Fig. 9 as operated on a lathe or boring-mill, producing a ball joint. Figs. 10 and 11 show it as operated for cutting tapers of any desired angle.

Figs. 12 and 13 are two irregular shapes produced by starting the respective cranks from different positions.

ROPE STRAIN PROBLEM SOLUTION

By J. Davies

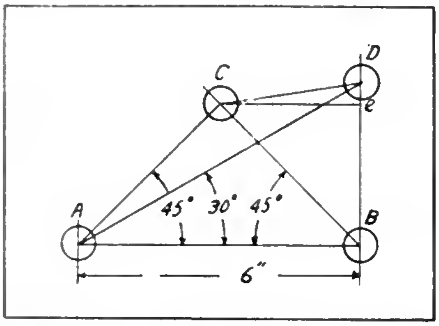
IN answer to question No. 2, on page 35, Jan. 13 issue of Canadian Machinery, I should say that there is no difference in the strain on the ropes from, the fact that to obtain a given strain or pressure there must be a corresponding resistance. In the first place, the resistance is taken up by the eyebolt, and in the second place, by the pull in the opposite direction. If the eyebolt were replaced by a spring balance and a pull of 200 lbs. exerted on the other end, the balance would also record 200 lbs., thus fulfilling the conditions of Fig. 2. It is my opinion the strain would be equally divided.

The New York Continental Jewell Filtration Co., will supply a filtration plant for the Macdonald College at St. Anne de Bellevue, Que.

Series of Practical Questions and Answers for Mechanics

Every care is being taken to include only pertinent practical questions, and give same direct, reliable answers. Catch questions will be avoided. Arithmetic, consisting of simple addition, subtraction, multiplication and division will be found a useful companion study.

Question.—In the sketch of the piercing die shown, the centre distance between the holes A and B is 6 inches; the hole C is to be equidistant from A and B, the centre lines forming angles of 45 degrees. The hole D is to have a position so that the line of centres between A B and B D will be at right



CENTRE DISTANCE OF HOLES QUERY.

angle (90°) and the angle D A B will be of 30 degrees. What will be the various centre distances of the holes?

Answer.—As the angle A C B will be 90 degrees, the centre distance A C or B C will be the square root of one-half the square of the distance A B, or by formula AC =

$$\sqrt{\frac{(AB)^2}{2}} = \sqrt{\frac{6\times6}{2}} =$$

$\sqrt{18} = 4.242 +$ inches.

To find the distance B D, multiply the length A B by the tangent of 30 degrees, and by looking up a table of angle tangents we find this to be .57735. The distance B D will therefore equal $6\times.57735 = 3.464$ inches.

The distance AD can be found by the formula $\sqrt{(6^2+3.464^2)} = 6.929$ inches; or by formula which makes hypotenuse = side adjacent $\div$ cosine $= \frac{6}{.86603} = 6.929$ inches.

To proceed further and find distance C D, it will be necessary to find the length of the line C e, which divides the triangle B C D into two right triangles.

Ce = (BC) $\times$ sine of 45 degrees = $4.242 \times .70711 = 2.999$ inches.

Be and Ce being equal, , De = $3.464 - 2.999 = .465$ inches Then CD = $\sqrt{[(Ce)^2 + (De)^2]} = \sqrt{(2.999^2 + .465)^2} = 3.063$ inches.

* * *

Question.—While boring some deep holes recently with a round boring bar, I had great difficulty in obtaining a smooth cut due to the borings gathering below the bar and at intervals crowding, resulting in the tool digging into the work. Can this trouble be remedied?

Answer.—It is often advisable when circumstances permit to wind a spiral of small wire around the bar, securing the ends by soldering, or inserting in a small drilled hole. This method gradually works the chips to the mouth of the hole and prevents clogging below the bar.

* * *

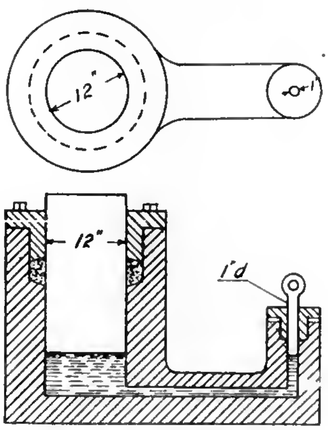
Question—(a).—To exert a pressure of 25 tons on the ram of the hydraulic press here shown what would be the gauge pressure

(b)—What would be the pressure acting upwards on the pump plunger?

(c)—How many strokes of the pump plunger would be required to raise the ram 10 inches, stroke of plunger being 3 inches?

(a)—Gauge pressure would be weight divided by piston area = 25 tons $\div$ $12^2\times.7854 = \frac{25\times2000}{12\times12\times.7854} = 442$ lbs. per sq. in.

(b)—Pressure required on pump plunger to force water into ram cylinder against a weight of 25 tons would be 442 lbs. multiplied by area of pump plunger, or $442\times1^2\times.7854 = 347$ lbs.



HYDRAULIC PRESS QUERY

(c)—Number of strokes required will be volume of water necessary to raise ram 10 inches divided by discharge of plunger at one stroke, or $\frac{12^2\times.7854\times10}{1^2\times.7854\times3} = 480$ strokes.

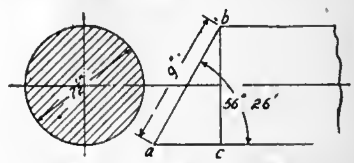
* * *

Question.—What is a good lubricant for machining aluminum?

Answer.—Very good results have been obtained by using kerosene or equal parts of kerosene and lard oil. A satisfactory compound can also be made by mixing soap suds with kerosene.

* * *

Question.—A round shaft, 7½ inches in diameter, is to be shaped at an angle on one end so as to form an ellipse with a major axis of 9 inches and a minor axis equal to the diameter of the shaft. What angle will the face make with the shaft axis?



ROUND SHAFT QUERY.

Answer.—The solution of this and similar problems comes under that of triangles. By forming a right triangle (as shown) with the major axis of the ellipse as the hypotenuse, the diameter of the shaft as one side and the length A C, the remaining side, we can solve the problem.

By formula we have sine of angle b a c $= \frac{\text{side opp.}}{\text{hypotenuse}} = \frac{bc}{ab} = \frac{7.5}{9} =$ .83333.

This corresponds to an angle of 56 degrees, 26 minutes.

* * *

Question.—Should a tool for planing brass have any rake?

Answer.—For smooth work it is advisable to have from 5 to 10 degrees negative rake.

* * *

Question.—What is meant by a cycle of operations?

Answer.—A series of events or movements which are repeated again and again constitutes a cycle of operations. In the case of a four-cycle gas engine, the cycle is completed when the piston has made four single or two return strokes—the intake, compression, firing and exhaust.

In the case of screw-cutting on the lathe, the cycle might be designated as the setting of the tool to depth of cut; engaging lead screw; removing stock; releasing lead screw and backing off cutting tool, and returning tool to first position.

Question.—In the construction of circular shears for thin sheet metal, are the shafts placed in the frame so that the face of the cutters are in the same plane?

Answer.—It is advisable, in some cases necessary, to offset the shafts from

CIRCULAR SHEARS QUERY

1-32 to 1-16 inch per foot of length so as to give shear to the cutters; this throws the face of the latter at a slight angle to each other—somewhat exaggerated in sketch.

* * *

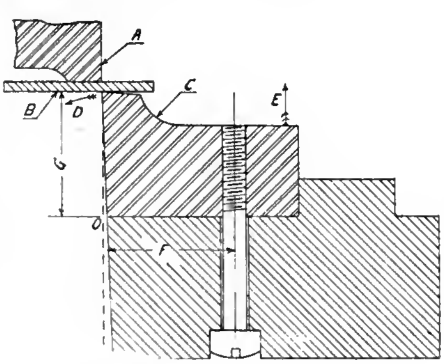
Question.—The remark has often been made that "the car took the corner on two wheels" but when asked which two wheels were off the ground, the answer is usually the outer wheels, or those describing the larger curve. In the case of an auto turning a sharp corner, which wheels would be inclined to lift from the ground?

Answer.—A moving body will always tend to travel in a straight line, unless acted upon by some other force; to follow the same direction, and the sudden change causes the inner side to raise. This is very noticeable if you are on a sleigh or vehicle when turning a corner, the weight of the body is thrown to the inner side, so as to shift the centre of gravity over the edge that has a tendency to rise from the ground.

* * *

Question.—When securing the steels of a large sectional die, to the die bed or bolster; what is the best location for the screws?

Answer.—This would depend largely upon the style of die, shape of section, and also the width of steel used. The screws are for the purpose of holding



SECTIONAL DIE QUERY

the steel sections securely to the bolster. As shown in the sketch, the punch A when cutting the stock B will have a tendency to rock the steel C about the point O, forcing the cutting edge at D and lifting the back as shown by the arrow E. It is therefore advisable when conditions permit to keep the screws somewhat back of a centre position. This will require materially the inclination of the steels to lift when pressure is applied at the cutting edge. If the steels are of sufficient width, increased rigidity is obtained by staggering the screw holes.

* * *

Question.—Sometime ago we had a spiral to cut upon a 3 inch shaft, two ft. long, with journal 1¼ inch. dia. and 3 inches long on each end. The spiral was to form a rib ¼ in wide and ⅜ in. deep, with a pitch of 2¼ inches, or 8 turns in the length of the spiral. After much changing and trying, with different sets of gears, we succeeded in getting those proper for the work.

(a)—What method is used in finding the desired wheels for odd pitches?

(b)—How can I determine the clearance angle of the cutting tool?

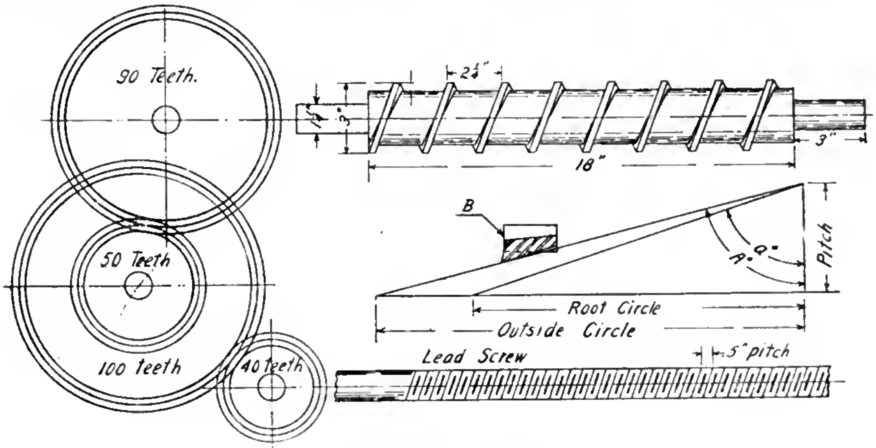
Answer, (a)—With a lead screw of ½ inch pitch, it is obvious that while the work is revolving once, the saddle, with cutting tool, is advancing 2¼ inches. To move the saddle this distance by means of the lead screw, it is necessary that the lead screw revolve 2¼ divided by .5, or 4½ times. The ratio therefore between the speeds of the lead screw and the work is 2.25 to .5 or 4½ to 1, which must also be the ratio between the teeth of the drivers and driven wheels.

By using a gear of 40 teeth on the lead screw, the driving gear would be $40 \times 4\frac{1}{2} = 180$. As gears of this size are never supplied for screw cutting, it is evident that this same ratio must be obtained by compounding the train. Dividing 180 by 2 we obtain 90 for one of the drivers, and the intermediate compound pair must have the ratio of 2 to 1 as 100 and 50. To prove the accuracy of the gear train, the number of threads on the work multiplied by the driving gears should equal number of threads on the lead screw multiplied by the driven wheels or

$$\frac{1 \times 90 \times 100}{4.5 \times 50 \times 40} = \frac{1}{1} = 1$$

Other wheels would give the same result, but the resultant ratio must be the same.

(b)—The angle formed by the short leg and the hypotenuse of a right triangle, of which the pitch and the circumference are the two sides, is the desired clearance angle of the cutting tool. However, as the angle of advance is different at the outside diameter than at the root (as shown in the sketch) allowance for the sharper angle may be necessary.



SPIRAL CUTTING QUERY.

AMERICAN DYES INCREASE

Seventeen months of the European war, according to a report issued on Jan. 20, by Dr. Thomas H. Norton, the United States' Government's dyestuff expert, has seen American manufacture of dyes increase five-fold, and now this country is producing one-half of the colors it normally uses. Hope is held out that by 1917 the great bulk of artificial dyes consumed here will be made by American works from American raw material.

The report shows that under stimulus of high prices American producers have increased their output until, combined with the production of new factories, the country now is manufacturing coal tar dyes at the rate of 15,000 tons annually. Before the war the country manufactured 3,000 tons and imported 25,700, chiefly from Germany. Dr. Norton says, howeved, that the textile industry is bound to suffer until America can produce enough dyes for its needs, and the situation still is serious despite what has been accomplished.

The report emphasizes the desirability of increasing aniline products rather than a varied line of dyes, and declares the public will have to resign itself to fewer color shades.

Proposed legislation to block ruinous foreign competition in dyestuffs at the end of the war is endorsed.

NEW PROCESS DEVELOPMENTS

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

MANUFACTURE OF SHELL FORGINGS

THE enormous demand for shell forgings has led to the introduction of improvements in the methods of manufacture whereby the greatest possible number can be obtained in the least space of time. Owing to the wide range of dimensions of shells, different methods of treatment have to be adopted to facilitate handling, but briefly the system most generally used is, first, to pierce or punch the billet and then reduce or elongate it by forcing it through dies until the correct

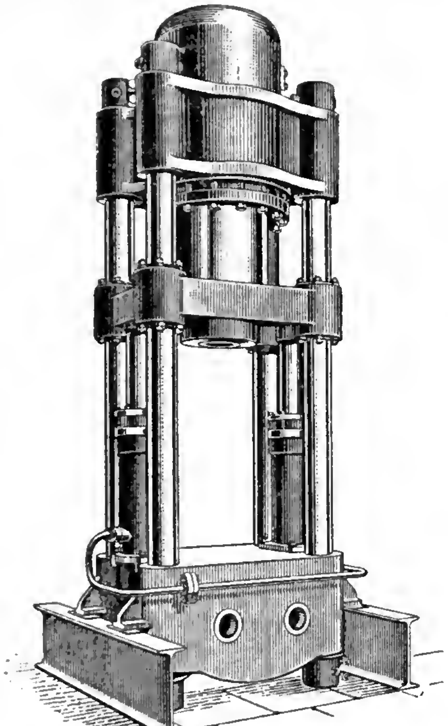


FIG. 1. HYDRAULIC PRESS FOR SHELL FORGINGS.

size and thickness is approximately reached: both operations being carried out on hydraulic presses. If such operations could be carried out with mathematical accuracy, a great reduction in the cost of manufacture of shells would be effected by the elimination of subsequent machining operations, but in practice it is found that this is quite impossible, and as machining is always necessary, it is much less costly to remove more of the surplus steel by cutting tools than to attempt to achieve this end by means of the forging and drawing operations.

Piercing Operation

A method of producing shell forgings which is widely adopted at the present time, and which appears to give very satisfactory results, has been introduced by the firm of John Shaw & Sons (Salford), Ltd., Manchester, England, says The Engineer. It produces the shell bodies by two operations, punching and drawing in one heat, and is illustrated in the accompanying cuts. Fig. 1 is a general view of the type of press employed for piercing shells up to any size, as well as for drawing cases up to 5 in. diameter. For drawing shells of larger diameter a press with the cross-head working upwards instead of downwards is employed, in order to facilitate the removal of the shells when they have passed through the dies.

Figs. 2, 3, 4, 5 and 6 represent sectional views of the punching press for shells of the smaller sizes, and in this machine the cross-head works downwards. In these drawings, A is the punch, which is cooled by a water spray M; B is the receptacle for the billet, which is also water-cooled; C, a loose base somewhat smaller in diameter than B; D a removable guide and stripper for the punch; E an ejector rod for removing the shell operated by means of rods G and yoke piece F from the moving head H, which is raised by the lifting cylinders; K and L are stops for regulating the stroke of the punch, and O is a horse-shoe-shaped cover bolted to the block P. The billet is introduced through the open side of the cover O into the receptacle B. The removable guide and stripper D for the punch is placed in position, and the moving cross-head H is forced down by the main ram. Thus the billet is punched as shown in Fig. 4, the stroke being regulated by the stops K, above mentioned, and the thickness of the base of the shell by the adjusting strips L. When the cross-head is raised by the lifting cylinders, the guide or stripper D comes in contact with the inside of the cover O, so that the punch may be withdrawn from the shell S. The guide and stripper D is taken away and the shell is lifted out by pincers or tongs. This completes the punching or piercing operation.

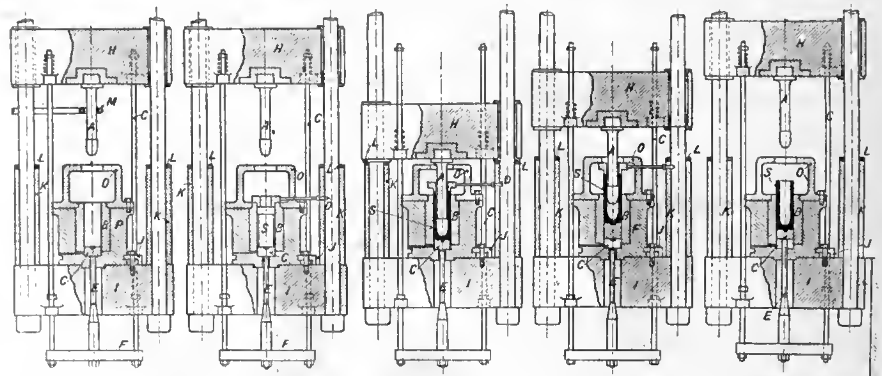


FIG. 2. FIG. 3. FIG. 4. FIG. 5. FIG. 6.

SECTIONAL VIEWS OF VERTICAL SHELL PUNCHING PRESS.

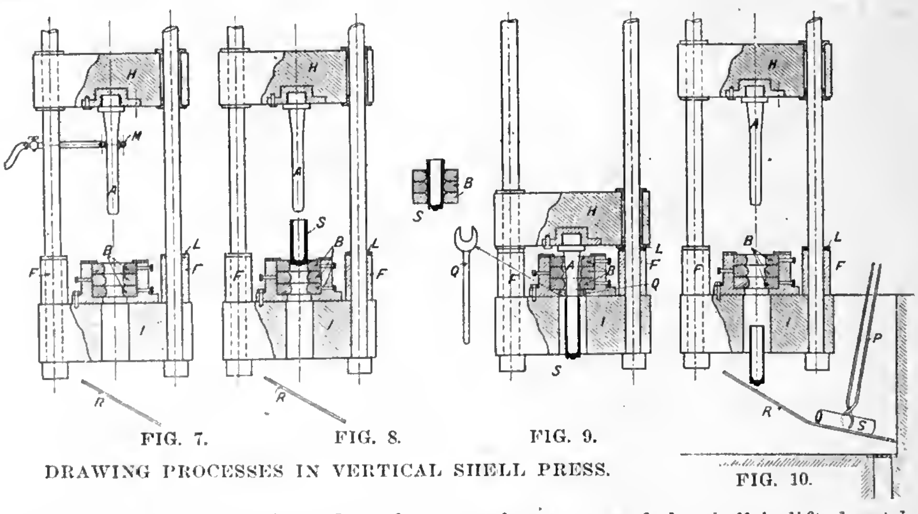


FIG. 7. FIG. 8. FIG. 9. FIG. 10.

DRAWING PROCESSES IN VERTICAL SHELL PRESS.

Drawing Operation

The process of drawing is very clearly shown in the sectional views—Figs. 7, 8, 9 and 10. In this part of the work the moving head also moves downwards, the shell being treated in the same heat after leaving the punching press. The dies B are three in number, secured in a block fixed to the table I. They are of different sizes internally, the largest being at the top. As the dies become worn by constant use the topmost one is removed and the two lower are raised to enable a smaller one to be introduced at the bottom, so that only one new block is required at a time. Fig. 8 shows the shell ready for drawing, the centre view shows it passing through the dies, and Fig. 9 shows the finished shell on the mandrel A. The stripper Q is now placed in position through the gap under the dies, and the moving cross-head is raised by the lifting rams, the shell being thus released from the mandrel A. Fig. 10 shows the moving head returned to its upmost position and the shell dropping into the chute R, from which it is removed by the tongs P. The number of shell bodies which can be punched and finished in this way varies between twenty and fifty per hour, according to their size. The hydraulic pressure employed varies from 150 to 250 tons.

Drawing Operation for Large Shells

Figs. 11 to 15 are sectional drawings showing the process of drawing shells 6 in. diameter and upwards. Fig. 11 shows the base of the shell which has come from the punching press being cooled with a jet of water ready for drawing. The crosshead H of the press in this case moves upwards, delivering the finished shell at the top of the press, from which it is led away by means of a chute, thus economizing manual labor in handling. In Fig. 12 the mandrel A is shown screwed into a sliding table T, and the shell S is placed in position ready for going into the press. The two dies B are separated by an annular ring, so that the shell is nearly through one before entering the second, which is smaller in diameter. In Fig. 13 the sliding table T is shown in its working position; in Fig. 13a the shell is seen passing through the dies; in Fig. 14 the work of drawing is completed and the stripper Q is in position ready for removing the shell when the mandrel is withdrawn by means of push-back rams. In Fig. 15 the shell S is shown stripped after passing through the dies. It is lifted on to the chute R, which delivers it by gravity to any required spot and the stripper Q is withdrawn. The table T is drawn out as shown in Fig. 12, and the mandrel A cooled by means of a water spray in readiness for the next shell.

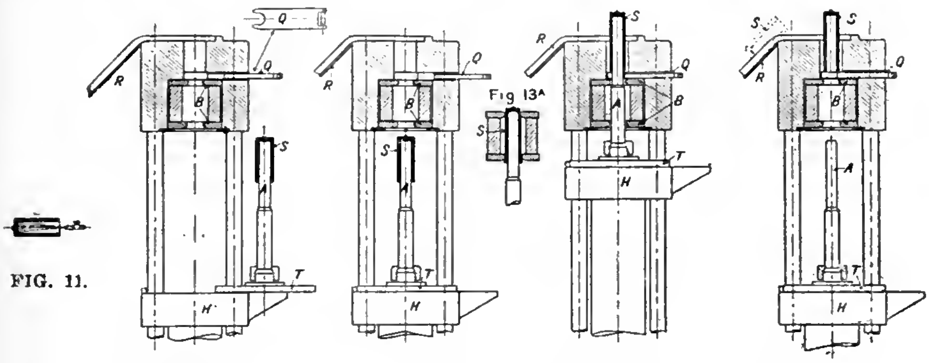


FIG. 11. FIG. 12. FIG. 13. FIG. 14. FIG. 15.

PROCESS OF DRAWING LARGE SHELLS ON VERTICAL PRESS.

ALLOY STEELS—I*

By G. L. Norris

STEEL may be broadly defined as an alloy of iron and carbon that can be forged and rolled. From expediency and necessities of manufacture, certain impurities beneficial or otherwise are present, but not in sufficient amounts to materially alter the characteristics of the pure alloy of iron and carbon. Under this definition, steel, or as it is now often referred to, carbon steel, is usually within the following maximum composition:—Carbon, 1.50 per cent.; manganese, 1.00 per cent.; silicon, 0.35 per cent.; phosphorus, 0.05 per cent.; sulphur, 0.05 per cent.

An alloy steel is steel alloyed with one or more metals, in sufficient amounts to influence or change the characteristics of steel, and still be possible of forging or rolling. The usual steel alloying metals are manganese, silicon, nickel, chromium, tungsten and vanadium. As these metals will all alloy with each other, it is evident that it is possible to obtain a great variety of alloy steels. Steel containing upwards of 1.50 per cent. manganese is not commonly considered an alloy steel, although this percentage of manganese undoubtedly has some effect on the characteristics of steel. This is due no doubt to the fact that manganese is always present in steel.

Alloy Steel Groups

The alloy steels are usually divided into two groups; ternary steels, with one metal alloyed, and quar-ternary steels, with two metals alloyed. The more complex alloy steels are practically limited to high-speed tool steels. The general characteristics of alloy steels are high elastic limit and great strength combined with a high degree of toughness as compared with the carbon steel with which they are alloyed. The strength and hardness can be enormously increased by heat-treatment (quenching and tempering) and still have the steel retain great toughness.

Alloy steels are not as a rule placed in service in the condition as forged or rolled. The forging and rolling temperatures are usually so high that the steel requires heat-treatment to refine the grain and develop the exact combination of strength, hardness and toughness desired. It is frequently necessary to anneal after forging in order to facilitate machining operations. This, of course, necessitates subsequent heat-treatment. Most alloy steels are of medium or low carbon content. The corresponding simple or carbon steels are only slightly or moderately improved in strength by heat-treatment.

*From a paper presented at the International Engineering Congress, San Francisco, Cal.

PROVINCE OF NOVA SCOTIA PRODUCTS IN 1915

Coal	$ 21,000,000
Coke and bye products	2,500,000
Gold and other minerals	275,000
Gypsum, limestone, etc.	900,000
Building materials and clay products	200,000
Iron and steel products	15,000,000
Fisheries	7,800,000
Manufactures, ships and freights	39,500,000
Products of the farm	32,347,658
Products of the forest	4,600,000
Game and dues	500,000
Total	$124,622,658

ROPE TENSION PROBLEM

by H. Jones

REFERRING to the problem appearing in the January 13 issue of Canadian Machinery, page 35, re the tension on the two ropes illustrated, it is my opinion that the strain upon each rope will be the same. Although it is not so apparent, the pull must be the same at the eyebolt as at the point D in the lower rope. Regarding the tension in the rope, I believe the strain is equal at all points between A and B in the top rope and at C and D in the lower rope.

PROGRESS IN NEW EQUIPMENT

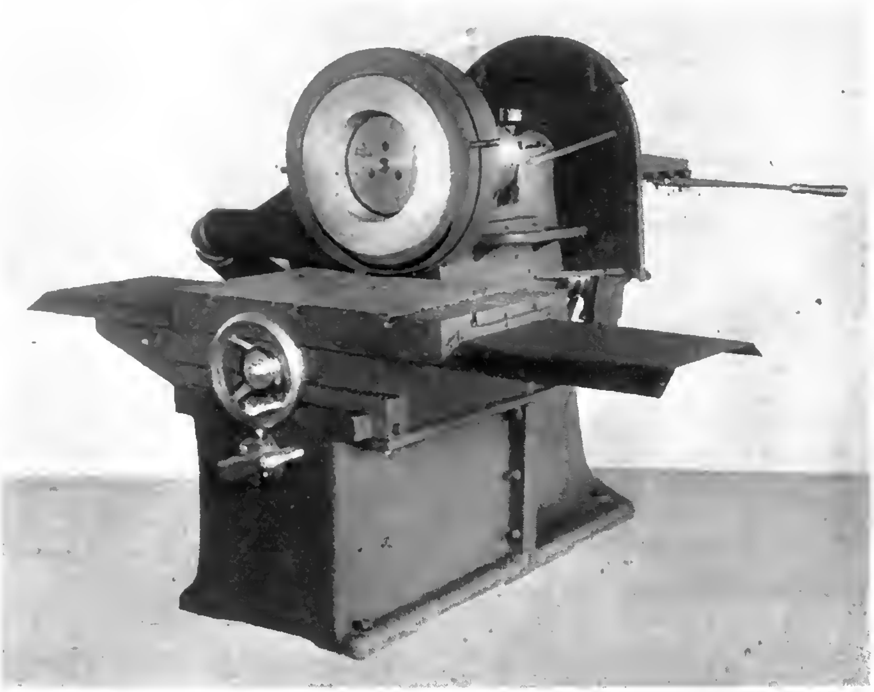
A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

A SPECIAL GRINDER

THE Gardner Machine Co., Beloit, Wis., have developed a special grinder which is an adaptation of their regular No. 6 machine. The special feature is the work table at the left hand end. The top of this table measures 20-inches wide by 30 inches long, and is provided with T-slots for attaching either the work or suitable fixtures. It has longitudinal travel of 20 inches, same being obtained by turning the hand wheel at front. The hand wheel shaft carries a pinion which engages with a rack attached to the under side of the table. The feed towards the table is accomplished through a finely threaded screw provided with a crank as shown. The length of feed travel is 6 inches. All wearing parts are completely protected from dust and grit.

An 18-inch abrasive ring wheel held in a "Perfection" chuck is the grinding member used. The work to surface is suitably attached to the table and fed by this grinding wheel in the usual manner. The right hand end of the spindle carries a 26-inch diameter abrasive disc wheel which is served with a universal lever feed table. Both the disc wheel and the chuck wheel are enclosed with dust hoods and attached to dust exhauster in rear of the machine.

The spindle is 2 inches in diameter and the driving pulley is 8 inches in diameter with $8\frac{1}{2}$ inches face. A 26-inch. disc wheel press, countershaft and extra supplies, are included in the machine equipment.



SPECIAL GRINDER WITH WORK TABLE AT LEFT-HAND END.

1½ in. HAND SCREW MACHINE

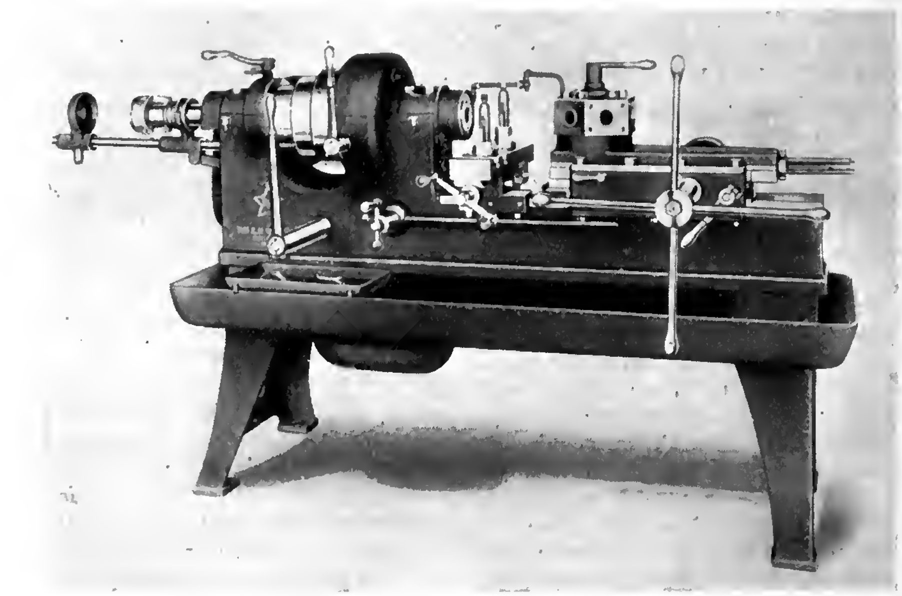
THE description and illustration refer to a recent product of the E. H. Wachs Co., Chicago, Ill., which is known as their 1½ in. "Star" hand screw machine. It is built with friction geared head, positive power feed to the turret slide, independent stops, automatic chuck and wire feed, and is equipped with oil pump and piping.

The entire machine is designed along lines which make for high production, and at the same time accurate work. By reference to the cut it will be observed that all the operating levers are within easy reach of the attendant. The head is of the 3-step cone type, and gives three open belt and three back geared speeds to the spindle. Reverse is obtained through the countershaft. The machine has a capacity through the collet of 1½ in., and turns for a length of 9 inches. Stock of full diameter can pass through the turret. The net weight of the machine complete with countershaft is 2,925 pounds.

In placing this machine on the market the Wachs Co. is not embarking on an entirely new field of endeavor. It is really re-entering the screw machine field, as some years ago it manufactured and sold a machine of much the same general type. The present machine, however, is of entirely new design, made from entirely new patterns and tools and modern in every respect. The machine, we understand, is brought out as a permanent production, and not to satisfy the present abnormal demand, and other sizes will be added as soon as business in hand permits.

ALUMINIUM FURNACE

THE application of aluminium and its alloys to industrial purposes has ex-



1½-INCH HAND SCREW MACHINE.

tended so considerably in recent years, that the subject of their melting is bound to appeal to a large number of manufacturers. Generally, melting has been effected in open crucibles, which allow atmospheric oxygen to attack the molten metal, with the consequent formation of dross. A gas fired furnace on entirely new principles, for melting aluminium and its alloys has been evolved after many experiments by the Monometer Manufacturing Co., Whitehouse street, Aston, Birmingham, and in which the usual difficulties met with, have, it is claimed, been overcome.

Melting pots made of metal are subject to the objection that the reaction which takes place between the molten aluminium and the impurities in the metal of which the pot is composed spoils the aluminium. In the furnace in question, this reaction is eliminated by the employment in the parts subject to attack of a special composition of metal which extended experience has shown to be immune from the action of impurities.

It is well known that a considerable portion of the molten metal goes to waste as oxide, and to prevent this deleterious action the melting pot is installed in a chamber containing inert gases incapable of oxidizing the molten metal. As there is no oxidation, it follows that there is no dross, and hence a considerable saving of material. The method of constantly replenishing the enclosed melting chamber with inert gases consists in causing the products of combustion to traverse the melting chamber on their way to the outlet flue. This sealing of the melting chamber also precludes the ingress of dirt and other foreign matter in the melting pot.

In connection with the heating arrangements, an ingenious device is used in order to take care of the gas supply when the melting point of the metal has been reached. The thermostat of the patented regulator, termed by the makers a "Monometer" controls and governs the quantity of gas supplied to the burners, so that immediately the aluminium is melted the quantity of gas used by the burners is reduced, and the uniform heat essential to the melting of aluminium is automatically maintained.

The Bunsen burners under the melting pot have contracted nozzles of such a design that a proper admixture of the gas and air takes place, resulting in perfect combustion and the full utilization of the heat in the fuel. The heat obtained by these low pressure atmospheric burners, which are coupled to the ordinary town supply, is stated to be comparable with that attained by high pressure gas, but without using compressors or fans.

The equipment of the furnace is completed by a central cone valve seated in the bottom of the melting pot and controlled by a conveniently arranged handwheel, by which the molten metal issuing from the pouring spout can be regulated or entirely shut off. At the top of the furnace are located two doors through which the swarf or metal is introduced into the melting pot, these doors being balanced so that they remain either in the closed or in the open position without being held by the operator. Casting is facilitated by mounting the furnace on a wheeled carriage which can readily be moved on rails from one part of the foundry to another, flexible gaspipes providing the means for allowing for this movement of the furnace.

ELECTRICAL ACCIDENTS IN ENGLAND

THE annual report of His Majesty's Electrical Inspector of Factories for the year 1914, has just been published in England, and besides the usual review and tabulation of the year's events, it gives considerable detail information regarding the more important accidents.

A reduction of 16 per cent. in the number of accidents occurring in factories other than electrical stations, etc., is shown compared with the year 1913, the number being 350 against 418.

The various accidents and their causes are given as under, the figures in brackets indicating fatal accidents:

Portable apparatus, connectors and flexible wires	65	(2)
Miscellaneous accidents in electrical manufacturing and repair works — mostly in testing operations	55	(1)
Working on live electrical apparatus or conductors—unskilled persons	46	(2)
Working on live electrical apparatus or conductors — skilled persons	42	(1)
Arcing of switches	38	...
Unprotected conductors, switches, terminals, fuses, etc.	36	(7)
Miscellaneous	31	(3)
Shocks or burns when replacing fuse wires	22	...
Arcing of fuses	9	...
Adjusting brushes and cleaning commutators, and flashing at commutators	6	...

The most frequent cause of accidents is again seen to be "portable apparatus." Twenty-six of the accidents due to this cause were occasioned by handling the flexible conductor. The report emphasizes the fact that proper examination of flexible conductors is unknown in many works, and a fruitful source of trouble constantly exists in worn out and damaged "flexibles." Various types of armouring come in for criticism, the spiral wire, and wire wove braiding being condemned, while whipcord braiding is recommended. The liability of the two former types of protector to penetrate the cord when damaged, and thus short circuit the entire sheathing, is pointed out as an objectionable feature.

In six cases accidents were caused through adapters being used in lamp sockets and connected with another lamp socket by common twin flexible cord, the connection with the movable lamp socket being carelessly made so that it became live unexpectedly. If the lamp holder cannot be earthed conveniently it should at least be insulated so that moist hands and floors may not form such death traps to unsuspecting workers.

The Dangers of Inexperience

The employment of apprentices and pupils on testing work is considered responsible for the numerous accidents in electrical factories. This work requires a degree of skill and experience which cannot be expected in beginners, and this fact, coupled with the use of equipment of a makeshift nature, contributes largely to these regrettable occurences.

One of the fatal accidents in "miscellaneous," was the outcome of conditions which exist in many workshops to-day and the danger is not realized till too late. It occurred in connection with a "fool-proof" fuse box where the fuses cannot be touched until the switch is off. This apparatus was made for using cartridge type fuses, but these had been replaced by ordinary fuse wire. One end of a fuse had been disconnected for some reason or another, and the box closed. The electrician was not aware that the loose end of the fuse wire was in contact with the box and when he closed the switch some time later he received a fatal shock from the iron case.

BREAKAGE OF DRILLS

Drills that are properly hardened and pointed are often condemned on account of breakage when the trouble should be rightly charged to the drilling machine. If there is any spring, lost motion or backlash between the upper part of the machine and the table, the drill will not begin to cut until the pressure has taken this up, after which the feed will be practically constant until the point of the drill breaks through. As this happens, the resistance to the penetration of the drill is abruptly reduced, and any spring or backlash in the parts of the machine will cause the drill to "hog in." The sudden increase in torsional strain which is thus produced, frequently causes drills to break.—Drill Chips.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - General Manager
H. V. TYRRELL - - - - Asst. General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor.

Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

B. G. NEWTON - - - - - Advertising Manager

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. JANUARY 27, 1916 No. 4

FINANCING CANADA'S WAR ORDERS

QUITE a divergence of opinion seems to exist, both among bankers and manufacturers of war munitions as to the means to be employed in solving financial problems arising from the prosecution of contracts. As far as we have gone there does not appear to have arisen a situation so desperate as to have called forth any radical departure from peace-time practice, still there is a growing disposition towards the formulation of some plan whereby the machinery of currency may be made to contribute more effectively to munitions and other war supplies output.

We have been engaged on war contracts for many months now, and these have been in many cases large, both in extent and cash value. No new contracts for the smaller size shells in amount equivalent to those given out in the first half or thereby of 1915 have been recently placed, and other reasons notwithstanding, there is a lurking suspicion abroad that until some more satisfactory scheme of financing munitions and other war supplies is devised and becomes operative, our opportunities to participate to the fullest extent possible in the distribution of war contracts will be less in evidence.

It has been borne in upon us in recent weeks that Great Britain would welcome our taking steps to finance in large part our war contracts to her order, and it surely is nothing short of complimentary to us that we have been so informed, and that such confidence is displayed in our resources and resourcefulness. It is altogether childish to maintain that for our production activities welfare, we must have cash paid "right on the nail," such an attitude being indicative of a lack of grasp and appreciation of the highly abnormal circumstances in which we are placed and of the unprecedented times through which we are passing. It is not a question of what must be done—except of course we regard the lack of recent orders for large quantities of the smaller size shells. It is a question of what should and can be done, but will we allow ourselves to be big enough to tackle the job.

We cannot expect even our most substantial manufacturing corporations to extend credits unduly—until the end of the war as has been suggested, and there is little need that they do so. The Canadian Government is in a position to find the necessary money either by borrowing from its own people through the medium of War Loans or from the United States. At all events, and third in order, there is the possibility of establishing a National Currency, which, despite many reasonable objections, need not, if issued against the collateral of British Exchequer bonds and made redeemable in a short term of years, be accounted as derogatory to our national financial standing.

In spite of the fact that Britain's gigantic war machine has now made her largely self-contained as far as placing contracts abroad is concerned, there is little doubt that in the immediate future months we can participate quite largely in the distribution of shell orders if we but contrive to and succeed in our efforts to finance them. Joint action by our Government, our bankers and our manufacturers is in order.

CONCERNING A SUGGESTED DEPARTMENT OF MANUFACTURES

THE suggestion is made by a correspondent of an American technical publication that a Department of Manufacture be established to so direct the actions of the nation in regard to manufacturing that consumers would be assured of getting the most satisfactory return for their money by regulating their purchases in accordance with the departmental findings.

While the development of such a policy might be desirable and even beneficial in some lines of industry, its activities could very well be confined to the grading or classification of products not in direct comparison with those of a competitor, but with a scale of standards set up by the department. The shipbuilding industry of Great Britain is inseparably linked up with such advisory organizations as Lloyd's Register, British Corporation, etc., and while a prospective purchaser may receive numerous tenders for the construction of a ship, he can rest assured of receiving not less than a certain quality of product irrespective of price, according to whichever classification he decided on when arranging with either of the corporations referred to.

The desirability, indeed, the possibility of developing such a system into a national department is questionable. Engineering is a more or less concrete science. Its theories are capable of demonstration more visibly and convincingly than those of any other field. Its applications affect our lives every hour of the day; our comfort, pleasures, work, all are ultimately subject to the influence of mechanical science. The great majority of civilized people are dependent on its continued development for their livelihood, and their energy and success in any particular branch are due to their individual ability in adapting effort to meet a demand.

The prospect of having a State Department to sit in judgment and issue statements on the relative merits of different harvesters, automobiles, sewing machines, typewriters, electric irons, etc., is not likely to meet with a cordial welcome from manufacturers generally.

Opinions differ in machines as well as in politics and while the adoption of the suggestion might prevent a few novices annually from being imposed upon, the net results would not count for much, especially as many of the parties benefited in some ways might possibly suffer from discrimination in others.

The various aspects of manufacturing are too numerous and too subject to individual influence to allow of Governmental control and direction in the manner suggested by the correspondent referred to. The value of publicity has long been recognized by all important institutions and the records and transactions of Engineering Societies and kindred bodies throughout the world contain accessible information of a variety and value which no Government Department could hope to duplicate.

INDUSTRIAL NOTABILITIES

ROBERT OSBORNE McCULLOCH, Vice-President and Secretary-Treasurer, the Goldie & McCulloch Co., Galt, Ont.; Director, Galt Art Metal Co.; Director Mutual Life Insurance Co. of Canada; Director, Canada Trust Co.; Director, Union Bank of Canada; Director, Millers' & Manufacturers' Insurance Co., was born at Galt, Ont., on April 1, 1864, a son of Hugh and Janet (McCartney) McCulloch.

From being a pupil in Dr. Tassie's School, he went to the University of Toronto, graduating from same in 1885, with the degree of B.A.

On leaving the University he read law with McCarthy, Osler, Hoskin & Creelman, Toronto, and was called to the Ontario Bar in 1888; formed partnership with W. H. P. Clement (now Mr. Justice Clement, Vancouver), under firm name Clement & McCulloch,

ROBERT OSBORNE McCULLOCH
Vice-Pres. and Secy.-Treas. the Goldie & McCulloch Co., Galt. Ont.

Toronto, 1890-1892; practised alone, 1892-1897; came to Galt, 1897, as secretary-treasurer of the Goldie & McCulloch Co., becoming vice-president of that firm on the death of his father, Hugh McCulloch, September, 1910.

Mr. McCulloch is a member of the executive committee of the Canadian Manufacturers' Association; was first chairman of the Parks Commission, Galt; and for seven years the president of Galt Board of Trade. He has been president of the South Waterloo Conservative Association, since 1897.

He married Louise Leslie, daughter of the Rev. Alexander Leslie, Aberdeen, Scotland, on October 14, 1896, his family consisting of two sons and two daughters.

Mr. McCulloch is in religion a Presbyterian, and in politics a Conservative. His clubs are the Toronto, Waterloo County Golf and Country, and the Toronto Golf, while fishing, golf and riding constitute his recreations.

The family residence is Rothienorman, Galt, Ont.

Photo—Courtesy British and Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 75	
Ferro nickel pig iron (Soo)	25 00	
	Montreal.	**Toronto.**
Middlesboro, No. 3	$24 00	.....
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Glengarnock	28 00	.....
Summerlee, No. 1	33 00	.....
Summerlee, No. 3	32 00	.....
Michigan charcoal iron.	28 00	.....
Victoria, No. 1	27 00	.....
Victoria, No. 2X	26 00	.....
Victoria, No. 2 plain ..	26 00	.....
Hamilton, No. 1	26 00..	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto........	2.75
Common bar iron, f.o.b.. Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill....	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh....	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	2.75
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	2.40
Structural shapes	2.50
Plates	2.50

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

BOILER PLATES.

	Montreal	Toronto
Plates, ¼ to ½ in ,.100 lb.	$3 00	$3 00
Heads, per 100 lb.	3 10	3 20
Tank plates, 3-16 in.	3 25	3 30

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$15 25	$15 25
Copper, crucible	18 50	18 00
Copper, unch-bled, heavy	17 75	17 50
Copper wire, unch-bled.	17 75	17 50
No. 1 machine compos'n	14 00	14 00
No. 1 compos'n turnings	11 75	11 50
No. 1 wrought iron	11 75	11 00
Heavy melting steel....	9 00	10 00
No. 1 machin'y cast iron	14 75	14 00
New brass clippings	11 75	11 50
No. 1 brass turnings ...	9 75	9 50
Aluminum	30 00	30 00
Heavy lead	6 00	6 05

Tea lead	$ 5 00	$ 5 00
Scrap zinc	13 50	13 50

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect Dec. 14, 1915:

	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
Standard				
¼, ⅜ in.	60	36½	....	....
½ in.	65	45½	....	....
¾ to 1½ in...	70	50½	....	....
2 in	70	50½	66	46½
2½ to 4 in. ...	70	50½	69	49½
4½, 5, 6 in...	....	....	67	47½
7, 8, 10 in.	....	....	64	42½
X Strong P. E.				
¼, ⅜ in.	53	36½	....	....
½ in.	60	43½	....	....
¾ to 1½ in. ..	64	47½	....	....
2, 2½, 3 in. ..	65	48½	....	....
2 in:	....	....	60	43½
2½ to 4 in. ..	....	....	63	46½
5½, 5, 6 in. ..	....	....	63	46½
7, 8 in.	....	....	56	37½
XX Strong P. E.				
½ to 2 in.	41	24½	....	....
2½ to 6 in.....	....	....	40	23½
7 to 8 in.	....	....	37	18½
Genuine Wrot Iron.				
⅜ in.	54	30½	....	....
½ in.	59	39½	....	....
¾ to 1½ in. ..	64	44½	....	....
2 in.	64	44½	60	40½
2½, 3 in.	64	44½	63	43½
3½, 4 in.	....	....	63	43½
4½, 5, 6 in. ..	....	....	60	40½
7, 8 in.	....	....	57	35½

Wrought Nipples.	
4 in. and under	75%
4½ in. and larger	70%
4 in. and under, running thread..	55%
Standard Couplings.	
4 in. and under	57½%
4½ in. and larger	37½%

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws.....	45%
Flat & But. Head Cap Screws....	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto.
Lake copper, carload ...	$27 50	$27 50
Electrolytic copper	27 50	27 50
Castings, copper	27 00	27 00
Tin	45 50	45 50
Spelter	21 00	21 00
Lead	7 75	8 00
Antimony	45 00	40 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton.
Bessemer billets, Pittsburgh....	$33 00
Open-hearth billets, Pittsburgh.	35 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	45 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 10	$3 05
Cut nails	2 90	3 00
Miscellaneous wire nails..	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	3 45	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	65
Stove bolts	75 and 10
Plate washers	40
Machine bolts, ⅜ and less......	57½
Machine bolts, 7-16 and over....	47½
Blank bolts	47½
Bolt ends	47½
Machine screws, iron, brass.....	35
Nuts, square, all sizes.....3c per lb. off	
Nuts, hexagon, all sizes..3¼c per lb. off	
Iron rivets	60
Boiler rivets, base, ¾-in. and larger	$4.10
Structural rivets, as above	4.00
Wood screws, flathead, bright	85 p.c. off
Wood screws, flathead, brass	50 p.c. off
Wood screws, flathead, bronze	45 p.c. off

LIST PRICES OF W. I. PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong. Sizes Ins.	Extra Strong. Price per ft.	D. Ex. Strong. Size Ins.	D. Ex. Strong. Price per ft.
⅛in	$.05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	....	....
7 in	2.38	7 in	3.81	....	....
8 in	2.50	8 in	4.34	....	....
8 in	2.88	9 in	4.90	....	....
9 in	3.45	10 in	5.48	....	....
10 in.	3.20	....	....	....	....
10 in.	3.50	....	....	....	....
10 in.	4.12	....	....	....	....

COKE AND COAL

Solvay Foundry Coke	$6.50
Connelsville Foundry Coke	5.95
Yough Steam Lump Coal	3.98
Penn. Steam Lump Coal	3.88
Best Slack	3.25

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	25%
At warehouse	15%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS

Solder, half-and-half	0.24½
Putty, 100-lb. drums	2.85
Red dry lead, 100-lb. kegs, per cwt.	9.65
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.28½
Benzine, single bbls., per gal.	0.28
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	1.09
Linseed oil, boiled, single bbls.	1.12
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	5.00
Lead Wool, per lb.	0.11
Pure Manila rope	0.17½
Transmission rope, Manila	0.21½
Drilling cables, Manila	0.18½
Lard oil, per gal.	1.10
Union thread cutting oil	0.60
Imperial quenching oil	0.35

POLISHING DRILL ROD

Discount off list, Montreal and Toronto	40%

PROOF COIL CHAIN.

¼ in.	$9.00
5-16 in.	5.90
⅜ in.	4.95
7-16 in.	4.55
½ in.	4.00
9-16 in.	4.20
⅝ in.	4.10
¾ in.	3.95
⅞ in.	3.80
1 inch	3.70

Above quotations are per 100 lbs.

TWIST DRILLS

	%
Carbon up to 1½ in.	55
Carbon over 1½ in.	25
High Speed	
Blacksmith	55
Bit Stock	60 and 5
Centre drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 50	$3 75
Canada plates, dull, 52 sheets	3 50	3 60
Canada Plates, all bright	4 60	4 75
Apollo brand, 10¾ oz. galvanized	6 40	6 50
Queen's Head, 28 B.W.G.	6.75	7 00
Fleur-de-Lis, 28 B.W.G.	6 50	6 75
Gorbal's Best, No. 28	6 40	6 40
Viking metal, No. 28	6 10	6 10
Colborne Crown, No. 28	6 00	6 50
Premier No. 28, U.S.	6 50	6 50
Premier, 10¾ oz.	6 75	6 75

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$17 00	.....
1¼ in.	17 00	.....
1½ in.	17 00	11 55
1¾ in.	17 00	11 55
2 in.	18 00	11 00
2¼ in.	20 00	12 10
2½ in.	21 00	14 15
3 in.	28 00	14 60
3½ in.	32 00	18 00
4 in.	38 00	23 00

Prices per 100 feet, Montreal and Toronto.

WASTE.

WHITE.	Cents per lb.
XXX Extra	0 15¼
Grand	0 14
X L C R	0 12¼
X Empire	0 11½
X Press	0 10¼
COLORED.	
Lion	0 09
Standard	0 08
Popular	0 07
Keen	0 06
WOOL PACKING.	
Arrow	0 20
Axle	0 14
Anvil	0 10
Anchor	0 08
WASHED WIPERS.	
Select White	0 09
Mixed Colored	0 07
Dark Colored	0 05½

This list subject to trade discount for quantity.

BELTING RUBBER

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$12.75
3-16 in.	8.85
¼ in.	6.15
5-16 in.	4.90
⅜ in.	4.05
7-16 in.	3.85
½ in.	3.75
⅝ in.	3.60
¾ in.	3.60

Prices per 100 lbs.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.06
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy.	.30
Copper sulphate	.15
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	3.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.20
Zinc sulphate	.07

Prices Per Lb. Unless Otherwise Stated.

ANODES

Nickel	.47 to .52
Cobalt	1.75 to 2.00
Copper	.27 to .30
Tin	.45 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs	.4½ to .06
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.04 to .06
Emery composition	.07 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., Jan. 24, 1916.—Recent statistics issued by the Department of Trade and Commerce covering the last nine months of 1915 show enormous expansion. The grand total of trade for this period shows an increase over the corresponding period last year of $265,-476,544. While this is largely due to the present abnormal conditions, it also demonstrates that the industrial resources of the country are capable of very great expansion when circumstances demand it.

Steps are now being taken for the establishment in Canada of a nickel refining industry, and before long it is anticipated that operations will be commenced on this most important work. The project, which is being advanced by private interests, is gaining favor with the Government, as it will provide the means for treating large quantities of ore within the Dominion. The value of this undertaking will be better understood when it is learned that Canada now produces about 85 per cent. of the world's supply of nickel.

Recent reports of Canadian banks show that the financial conditions are constantly improving, giving a much brighter aspect to the general situation.

Pig Iron

Although the market is comparatively quiet at present, the production of steel making iron is continuing with little or no abatement. Very little interest is being manifested by producers as to current prices, as the output of the blast furnaces is, in most cases, sold as far in advance as the end of the second quarter. No advance is quoted for this week, and the local conditions are practically unchanged.

Steel

The tension prevailing throughout all branches of the steel-making industry shows no signs of relaxation. The constant demand of large tonnage for shell making and munition purposes is calling forth every effort of the steel mills to keep up the supply. A feature that may result in serious trouble, both regarding production and price, is the feeling of unrest among the mine workers of America. An increase of 20 per cent. may be demanded, beginning April 1st, to be followed by a general strike, unless the mine operators comply with the demand.

Inquiries for steel billets are lighter, but production continues with unceasing energy, the supply still being below the requirements of shell makers and finishing mills. The market for plates and shapes is very strong, inquiries being large and deliveries uncertain; local quotations are firm at last week's prices.

The requirements of the sheet consumers are enormous, and mills are taxed to the utmost in the effort to supply the increasing demand. Many mills are running at 100 per cent. capacity, with orders running well into the second quarter. Blue annealed sheets are very active, but galvanized trade is a little lighter. From 5 to 10 per cent. advance is noted on all sheet quotations; black No. 28 is now quoted at $3.75; Canada plates, dull, $3.50; bright, strong, at $4.60. All galvanized sheets show a similar increase. Steel wire nails are stronger, showing an increase of 10 cents, advancing the price to $3.10.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Pressed spikes are now quoted at $3.45 per hundred pounds.

Metals

The general tone of the metal situation remains unchanged. The market is somewhat unsettled, owing to the stand of the British Government in forming a policy of protection along these lines. The strength of copper on foreign markets has not yet affected prices here, but expectations of the dealers are for a further advance.

Lead has shown a slight advance, and all other metals are comparatively firm.

Copper.—No relief is apparent in the copper situation, and producers report that it is impossible to supply dealers on early delivery, and even for future sale buyers are obliged to abide the action of the sellers. The rumors that a supply of copper was being held in stock at the refineries was largely due to the fact that the congested state of shipping facilities at certain points was such that material was accumulating at the plant, awaiting shipment to buyers.

Current rumors that there is a probability of a corner in copper, with prices at 30 cents (New York), has put the market in a very nervous condition. The present state of the market is such that almost any price may be quoted for prompt and early delivery. That the market will be still stronger is generally conceded, as the conditions show no precedent, and dealers must not confuse the present situation with others when the circulation of false reports were responsible for price advances. Foreign prices have advanced, but, while the local market is strong, dealers report quotations as holding firm, with a possible rise before the week-end.

Tin.—The strict censorship by the British authorities upon all foreign messages has delayed cable reports of market conditions. Late reports, however, indicate a strong market, but business remains normal. With a plentiful supply of tin in sight, there is little possibility of any advance. Local quotations are firm at 45½ cents.

Spelter.—With the continued difficulty of securing first quarter delivery, many inquiries are coming in for second quarter supply. As there is every indication that the production of spelter has recently increased, and the demand for galvanized material has slackened, there is a prospect of easier prices for futures. It is, therefore, surprising that quotations for late deliveries should be so strong, although from the apparent condition at present, the price of spelter may show strength before a decline. Local dealers report a fair market, with prices unchanged.

Lead.—The strength of the present market is largely due to the heavy foreign inquiry, and although there has been no report of sales resulting, the feeling that a stronger market is imminent is everywhere evident. The report that British trade in metals would be controlled by the Government has had the effect of disturbing the local market, but recent developments have given a more encouraging tone to the situation. Local quotations show an advance of ¼c per pound, this week's price being 7¾c per pound.

Antimony.—An evident scarcity of antimony has somewhat strengthened the market, and foreign quotations are higher, but local dealers report unchanged conditions. Present prices are firm at 45c per pound.

Aluminum.—The market remains firm at the prices quoted—68c per pound.

Machine Tools and Supplies

The machine tool trade is gradually becoming more normal, and the difficulty of securing delivery is not so pronounced as a few months back. Considerable work is still being done on munitions machinery, especially of the heavier type for large shells. Orders placed many

months ago are still awaiting delivery, much of the delay being due to labor troubles in the States. The demand for supplies, while not as great as some time ago, is still proportional to the business being done. The situation prevailing throughout the entire steel industry has had its effect upon many lines of machine shop necessities. All price lists on twist drills, reamers, files and machinists' small tools have kept pace with the general steel conditions. The lack of flax seed has been the cause of sharp advances in linseed oil, which is now quoted at $1.04 to $1.06 for raw, and $1.07 to $1.09 for boiled. The continued heavy demand and the apparent decrease in production of crude oil has gradually affected the price of gasoline, and further advances are expected.

Old Materials

The trade in scrap metals during the week has been rather quiet, but considerable business is being done in heavy melting steel scrap. Prices are generally firm; heavy lead being the only material showing an advance.

Toronto, Ont., Jan. 25.—The industrial situation is unchanged but the steady advance in prices of raw materials and finished products continues. There is little or no prospect of any decline in prices for some months, but rather a tendency to higher levels than prevail at the present time. This is becoming an important matter for manufacturers to contend with as it means increase in cost of production. The continued strength in the iron and steel and ingot metal markets is reflected in the higher prices for a number of products which have been announced during the week. The following are the more important—Machine screws, wood screws, boiler plates, wire rods, Manila rope, transmission rope and drilling cables, cotton waste, gasoline, benzine, scrap zinc, copper and lead also many lines of mechanics tools. Higher prices in the near future are anticipated for wrought iron pipe, black and galvanized sheets, wire nails, etc.

Steel Market

Great activity continues in the iron and steel trade and the mills are working at capacity in an effort to take care of the demand. Deliveries however, are getting behind and prices have a higher tendency. An advance has been made in boiler plates but otherwise quotations are unchanged. It is reported that the Algoma Steel Co. have booked orders for 30,000 tons of 85-pound section rails from a Canadian railway. The market is strong and the outlook very favorable.

Prices of black and galvanized sheets have advanced again and the market is very firm. Sheets are being sold on the local market below cost of importation, further advances may therefore be expected. Stocks are light, so re-sale prices will have to be based on manufacturers' costs, but profits are not sufficient to make the business worth while. The increasing cost of steel, the scarcity of acid, high labour cost, and advances in production costs generally are diminishing the margin of profit on sheets for the manufacturers.

The high speed tool steel situation is unchanged and prices still range around $3 per pound. The demand is not so heavy but enough to keep the mills working to capacity. Shipments from the States are coming in slowly and deliveries are very backward, owing to the heavy demand there. Some steel is coming through from England but all exports are controlled by the British Government and the requirements of British and French munition plants is taking up almost the entire production.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian.—Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

The steel market in the States continues very strong and prices of bars, plates and shapes have advanced to $2 per 100 lbs. The Pennsylvania Railroad has removed the embargo on export shipments to New York under certain conditions but the embargo to New England points is still on. Although the situation has been relieved, shipments to eastern Canada are still affected. The mills are sold up for three or four months and deliveries are getting more backward than ever. The demand for steel bars continues decidedly heavy, large contracts having been received for rounds for shells. The heavy demand for billets continues but prices are unchanged. Wire rods have advanced $3 and are now quoted at $45 per ton Pittsburgh.

Pig Iron

The pig iron market is a little quieter but the situation is unchanged. Lake Superior charcoal iron has advanced 50c and is now quoted at $19.75 per ton Chicago. Hamilton and Victoria are unchanged.

Old Material

The embargo on shipments of wrought and steel scrap is still on and will most probably remain in force. The Dominion Government has been asked by interests in the West to establish lower rates on cast iron scrap to the steel plants in the East. The market for this material has hitherto been in the States but this has been shut off by an embargo. The present freight rate is practically equivalent to the cost of the scrap. The market is firm with higher prices for scrap zinc, lead, copper and composition. Heavy melting steel is weaker and has declined. Fair business is reported, the principal demand being for copper.

Machine Tools

Conditions in the machine tool market show little change. The demand for shell making equipment has fallen off considerably but some nice orders have been taken for smaller tools for making shell parts. For the next few months this end of the shell industry promises to be very active as there is a good demand for shell parts the production of shell cases having got ahead of the capacity for completing them. Deliveries from machine tool makers in the States are still backward as the domestic demand there has improved considerably.

Supplies

Business continues brisk and prices of many supplies are going up. The L. S. Starret Co. have issued a new and revised price list in which some lines have been advanced. The Brown & Sharp Co. have also revised their price list on machinist's small tools, screw machine tools etc. Makers of wood screws have issued a new price list. Bright flat head screws are unchanged at 85 per cent., but the discount on brass and bronze flathead screws are now 50 per cent. and 45 per cent. respectively. The expected advance in gasoline and benzine has materialized. The oil situation is getting more serious owing to the steady increase in the demand for gasoline and shortage of crude oil. Gasoline is now quoted at 28½c and benzine at 28c per gallon being an advance of 1c per gallon. Indications point to higher prices.

The rope market is strong and prices are higher due to the increase in cost of raw materials, principally sisal and manila. Pure manila rope is now quoted at 17½c., transmission rope at 21½c., and drilling cable at 18½c base, per pound. Cotton waste has also advanced.

Metal Market

The market is considerably stronger and prices are higher for a number of metals, including copper, tin, spelter and lead. The higher prices are due to strength in the primary markets, the situation in London being the principal cause. Prices of copper although higher are really nominal owing to the difference between the prices at which a buyer can be found at different tonnages. Tin is higher in London, the market being apparently influenced by the strong copper and lead markets. A strong demand for spot and nearby spelter caused an advance in the market which is firm. An advance of $4 a ton in lead at New York, has been made by the "Trust" although outside lots have been disposed of at lower figures. Antimony and aluminum are both unchanged while solder is firm at last week's prices.

Copper—The market continues strong and higher. The enormous consumption of copper is absorbing the entire production, hence the position is a very strong one. The demand is unprecedented and will most probably increase during the year, higher prices are therefore anticipated. The market at present is largely nominal as the range of prices varies according to tonnage. Locally copper has advanced ½c per pound and is quoted at 27½c per pound.

Tin.—This market is strong in sympathy with other markets and is higher in London. The demand for tin is light and the trade is apparently well supplied with spot and early delivery metal. Tin has advanced ½c and is being quoted locally at 45½c per pound.

Spelter—The market is strong and higher. There is a heavy demand for spelter for all deliveries up to July and a scarcity of spot metal. In the local market spelter has advanced ½c and is quoted at 21c per pound.

Lead.—The "Trust" have advanced lead $4 per ton making the price 6.10c, New York. This market is firm but the outside market is a little below the "Trust" price. Lead is now quoted at 8c per pound representing an advance of ½c.

Antimony.—The market is firm at unchanged prices for spot and early deliveries. The situation is unchanged and prices nominal at 40c per pound.

Aluminum.—The market is firm and the situation unchanged. Aluminum is quoted at 68c per pound.

Solders.—Prices are firm and unchanged although the strength in the tin market may effect solders. Half-and-Half is quoted at 24½c per pound.

Winnipeg, Man., Jan 24.—The machine tool situation remains about the same. Very few inquiries are coming in, and what machinery is on order is hard to procure. All machine tool makers appear to be filled up with orders. Sawmills in the West continue to buy repair material. Taken on the whole, the outlook is good, indications are that there will be a decided improvement in the Spring. Rolling mills in the West are running full time in many cases, their product in most cases being sold to wholesale hardware dealers, who job it to country merchants and small machine shops.

One hears here and there of factories which have been idle for two years or less, opening up again. It is reported that a glass factory in Redcliffe, Alberta, has started operations again. The Carbondale Machine Co., of Carbondale, Pa. is also said to be preparing to start at Transcona, Man. This is a new concern, and it is believed they have brought much of the equipment they require from the other side. They are, however, in the market for a quantity of supplies. The general supply trade is in fair shape, indicating that firms are fixing up their plants. There is a steady demand for twist drills and belting. Local hardware jobbers have announced advances this week in a large number of lines.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

FINAL RETURNS ON 1915 CROP YIELD

THE final returns of the yield, quality and value of the grain crops of Canada for the season of 1915, were issued on Jan. 19, from the Census and Statistics Office. "As a result of the returns of the average yield per acre," says the report, "made after threshing, the total yields of the grain crops, in bushels, for the season of 1915, compared with 1914, are as follows:

"Wheat, 376,303,600, as against 161,280,000 in 1914.

"Oats, 520,103,000, as against 313,078,000.

"Barley, 53,331,300, as against 36,301,000.

"Rye, 2,394,100, as against 2,016,800.

"Peas, 3,478,850, as against 3,362,500.

"Beans, 723,400, as against 797,500.

"Buckwheat, 7,865,900, as against 8,626,000.

"Flaxseed, 10,628,000, as against 7,175,200.

"Mixed grains, 17,523,100, as against 16,382,500.

"Corn for husking, 14,368,000, as against 13,924,000.

"The average yields per acre in 1915 are, in bushels, as follows, the figures in brackets representing the yields of 1914 for comparison:

"Fall wheat, 29.41 (21.41); spring wheat, 28.93 (15.07); all wheat, 28.98 (15.67); oats, 45.76 (31.12); barley, 35.32 (24.21); rye, 21.31 (18.12); peas, 17.73 (17.64); beans, 16.70 (18.20); buckwheat, 22.88 (24.34); flaxseed, 13.18 (6.62); mixed grains, 37.54 (35.36); and corn for husking, 56.72 (54.39).

"For the principal grain crops the total yields represent the most abundant harvest in the history of Canada. With regard to wheat and oats, this result is due to a double cause; expansion of the acreage by special effort as a consequence of the war, and an exceptionally favorable season, giving for Canada the highest average returns per acre on record.

"The quality of the grain crops in 1915, as determined by the weight in pound per measured bushel, is, with the exception of one or two crops, superior to that of last year, and also superior to the average of the last five years. Weights per bushel for 1915 are as follows: Fall wheat, 59.71 lb.; spring wheat, 60.31 lb.; all wheat, 60.19 lb.; oats, 36.61 lb.; barley, 48.26 lb.; rye, 56.32 lb.; peas, 60.74 lb.; beans, 59.61 lb.; buckwheat, 48.02 lb.; flax, 55.28 lb.; mixed grains, 44.98 lb.; and corn for husking, 56.32 lb.

The total value of the principal grain crops of 1915 are as follows: Wheat, $312,569,400; oats, $176,894,700; barley, $26,704,700; rye, $1,899,900; peas, $5,730,700; beans, $2,206,800; buckwheat, $5,913,000; flaxseed, $15,965,000; mixed grains, $10,034,700; corn for husking, $10,243,000. Including the root and fodder crops, particulars of which were published last November, the total value of the field crops of Canada in 1915 amounts to nearly $800,000,000, comprising grain crops, $368,161,900; potatoes and sugar beets, $36,739,500; and fodder crops, $192,768,100.

"In the three North-West provinces of Manitoba, Saskatchewan and Alberta, the production of wheat in 1915 is estimated at 342,948,000 bushels, as compared with 140,958,000 bushels in 1914; oats at 334,840,600 bushels, compared with 150,843,000; of barley at 35,317,200 bushels, compared with 19,535,000; and flax at 10,559,000 bushels, compared with 7,083,000."

LAKE CARRIERS' ANNUAL

AFTER a season of navigation, most discouraging at the outset, but a record-breaker at the finish, vessel owners whose ships operate on the Great Lakes met in Detroit, Mich., on January 20, for the annual session of the Lake Carriers' Association. The annual report of William Livingstone, of Detroit, president of the organization, referred to the last season of navigation as "in many ways the most extraordinary year that the association has ever experienced."

"The association faces the year 1916," the report continues, "with lessened membership in point of numbers owing to economic changes which have been going on during the last decade, and which reached a striking fruition in the absorption of vessels during the closing months of 1915. In point of tonnage, however, the loss has been only 12,952 tons, mainly in second-class vessels, but this loss will be far more than made up by the first-class vessels now on the stocks."

Ore movements featured the season's operations. Up to August 1 the ore movement was 5,604,155 tons behind that of 1913. Shortly after August 1, business began to pick up, and every month thereafter was a record-breaker, 25,593,501 tons of ore being moved after that date. Every ship that could possibly be pressed into service was fitted out.

During 1915, 89,195,875 net tons of bulk freight were handled on the Great Lakes, an increase of 16,256 272 tons over 1914. Eleven vessels were lost during the year. The Eastland disaster brought the loss in lite up to 831 persons. Only 19 lives were lost, however, exclusive of the Eastland tragedy. The meeting of the association lasted two days.

CANADIAN CAR & FOUNDRY CO. RUSSIAN SHELL ORDERS

OFFICIAL announcement is made that a commission of five, acting as the directing board of Canadian Car & Foundry Co. agency in New York, has been organized to supervise the carrying out of the company's Russian shell orders.

Col. Dunn, of the U.S. Army, well known as an authority on explosives and the manufacture of ammunition, has been appointed general manager of the agency and given full charge of production, while J. P. Murray, one of the legal advisors of the Russian Shell Commission, has also been named on the board. The other three members are officers or representatives of the Canadian Car & Foundry Co., namely Senator Curry, president; W. W. Butler, vice-president; and C. H. Cahan, legal advisor.

The announcement is a sequel to various negotiations in progress for several months, which have aimed at placing the carrying out and the financing of the huge contracts, totaling approximately $145,000,000 in value, on a more satisfactory basis. In November it was believed that the financing arrangements would be made through important banking interests in New York, but a hitch developed and after dragging into the new year, it was finally stated that this plan was all off. Shortly afterwards announcement was made that the money necessary to finance the work would be forthcoming from the Russian Shell Commission and about two weeks ago the company received its first advance, it being officially stated that further funds would be available as required.

In addition to the board as constituted, it is stated that Brig.-General Ellershaw had been named as a trustee for the agency, presumably to supervise the disbursement of funds as advanced to the agency by the Russian Commission. The entire arrangement removes the last obstacle in the way of a successful carrying out of the contracts. Shipments of shells are said to be going forward satisfactorily and deliveries should be completed within the dates specified in the contracts.

The company's agency at New York was organized some months ago with a nominal capital of $20,000. All the stock is owned by the Canadian Car & Foundry Co., and what profits accrue from the shell business will be paid over to the present concern. The intervention of the agency in the contracts, however, assures a separation of the Russian business from the Canadian and British business of the company in Canada, and in this way facilitates financing through the Russian Shell Commission of the Russian sub-contracts placed in the United States.

EQUIPMENT FOR AUSTRALIAN NAVAL DOCKYARD

Tender forms and specifications have been forwarded by D. H. Ross, Trade Commissioner, Melbourne, for 43 machines of various types required for the equipment of the Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W. Tenders will be received, subject to the conditions specified, up to May 1, 1916, addressed to the Director of Navy Contracts, Melbourne, Australia. The last mail in time to reach Melbourne on May 1 is that leaving San Francisco on March 22 and due at Melbourne on April 12. The tender forms are open to the inspection of Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer file No. A-1435). Particulars of the requirements are briefly outlined thus:

Three 50-ton overhead travelling cranes.

One 25-ton overhead travelling crane.

Two 5-ton overhead travelling cranes.

One 10-ton revolving cantilever crane.

Two 5-ton travelling portal jib cranes.

Two 7½-ton jib cranes.

One 5-ton jib crane.

Two 15-ton hydraulic cranes.

One 6-ton hydraulic crane.

One 6-ton wall crane (hydraulic).

Two 3-ton wall cranes (hydraulic).

Two electric passenger elevators.

Two electric goods elevators.

One 2½-ton gauge locomotive with crane attached.

One 2½-ton gauge locomotive without crane attached.

Three electrically-driven air compressors, 1,500 cu. ft.

One 15-ton hydraulic winch.

One 5-ton hydraulic winch.

Nine 10-ton hydraulic capstans.

Two 5-ton hydraulic capstans.

One bar shearing machine.

One double-ended horizontal punching machine.

One 10-ton overhead travelling crane for shipyard fitting shop.

CANADIAN CAR & FOUNDRY CO.

IN addition to the orders placed in Canada and the United States by the Russian Government through the Canadian Car & Foundry Co. New York reports that General Germonius of the Russian buying commission, has placed business for 32,000 machine guns to be manufactured in Canada and the United States. The order is the largest of its kind ever given, and involves $31,500,000. Particulars of the firms securing the business are not yet announced, but it is stated that three American and one Canadian firms will divide the total. It is also reported that Russia is negotiating further shell orders on a big scale, involving 5,000,000 shrapnel and 5,000,000 high explosive.

NICKEL REFINING IN CANADA

STEPS are being taken, we understand, as a result of the recent visit to Ottawa of Ambrose Monell, creater of the International Nickel Co., for the establishment in Canada of a nickel refining plant, for the treatment of nickel ore and matte. The arrangements are as yet incomplete, but it is believed that comparatively little remains to be settled before the new industry becomes an accomplished fact.

The project is being advanced by private interests with large financial backing. The matter has also been taken up with the Government, and is believed to be looked upon by them with favor as providing a means for the treatment within the Dominion of the world's largest nickel output. The present plan is to locate the big plant at Cape Breton, N. S. The industry will probably be operated under some form of Government supervision, and with the definite stipulation that the Imperial Government shall have the first call on as much of the output as it shall require.

Refining Accessories Feature

The establishment of a plant in Canada will be a considerable economic problem, as it will entail increased cost of sulphur, free oils, coke, nitre cake, fire brick, fire clay, magnesite brick, and coal. Until now the refining has been done at Bayonne, New Jersey, adjacent to the great oil refineries and chemical plants. In the ordinary process the ore mined in the Sudbury district is transported to the smelter at Copper Cliff, and is there smelted by successive stages into a product known as copper-nickel matte, containing approximately 55 per cent. nickel 25 per cent. copper, and 20 per cent. sulphur. All of this matte has in the past been shipped to the Bayonne refinery, where the nickel and copper have been separated from each other.

When the war broke out, the Dominion Government took prompt steps to prevent the nickel produced in Canada and refined in the U. S. from reaching enemy destinations. Canada produce about eighty-five per cent. of the nickel supply of the world, chiefly from the Sudbury district of Ontario, the nickel being exported in the form of matte and refined in the United States and Great Britain. The danger that some of this Canadian product might find its way to the armament plants of enemy countries led the Canadian Government to take the matter up with the refining company in the United States, and a representative of the Government was given access to the company's books for the purpose of maintaining a check on exports. This plan had the full approval of the British War Office, and has worked out satisfactorily, but the establishment of a refining plant in Canada, which will take care of the Canadian raw product, will go even farther than such an arrangement.

New York Comment

New York official comment on the proposed refining of Canadian nickel matte within the Dominion indicates that the International Nickel Co., New York, will when the time is ripe undoubtedly acquiesce in the wishes of the Canadian people. However, it does not anticipate, in view of the vast interests involved and the importance to the war trade, that the Government will, for the present, cripple the industry in New Jersey, where plants worth millions have been erected, employing more than 1,000 men.

The International Nickel Co., capitalized at $62,000,000, treats three-fourths of the nickel matte produced in Canada, and 80 per cent. of the world's supply is obtained from Canada. The patented nickel lands of the International Nickel Company in Ontario cover 100,000 acres. The company owns the town of Copper Cliff,where it has eerected an up-to-date smelting plant. It also owns the shares of the Societe Miniere Caledonienne of New Caledonia, which possesses extensive nickel lands. Its output since the war began has increased 25 per cent.

CANADA'S TRADE

TRADE statistics covering the nine months of the fiscal year ended December 31, 1915, issued on January 19, by the Department of Customs, show the commerce of Canada to be expanding enormously.

Taking into account re-exports and the movement of coin and bullion, the grand total of the trade of the Dominion for the nine months reaches the imposing figure of $1,102,486,303, compared with $837,009,759 for the corresponding period of the previous fiscal year. That the volume is increasing is shown by the December returns, the trade of last month having reached a total of $148,-815, 954, compared with $70,382,903 for the same month in the previous year.

The December statement reveals heavy increases in both imports and exports, without taking into account the movement of gold or the export of foreign merchandise. For the nine months' period the imports show a slight shrinkage, amounting to $343,923,323, as against $348,746,920, but the December imports increased from $30,392,913 to $45,690,-721.

Exports of domestic merchandise in December totalled $92,171,402. In the previous December they amounted to the comparatively low figure of $37,193,609. While in the nine months' period they jumped from $306,823,039 to $511,534,-042. The increases in exports were found in nearly every column. Manufactures rose from $53,186,926 to $119,-392,269; agricultural products from $106,608,923 to $202,506,936 and animals and their products from $58,436,712 to $78,559,424.

The inland revenue returns also show a substantial increase, the total for the month of Quebec being $2,416,195, as against $1,897,774 in the corresponding month of the previous year.

AUSTRALIAN COMMONWEALTH INCOME TAX ON OVERSEA FIRMS

UNDER the Income Tax Assessment Act of the Australian Commonwealth, as amended, the position of an agent selling goods for a foreign principal is stated to be as follows:—

Goods are deemed to be sold in Australia if there is an Australian representative who receives commission or salary for obtaining orders, or for influencing the sale of the goods. The absentee principal is taxable on an income equivalent to 5 per cent. of the price at which the goods are sold. The agent is required to make returns on his own behalf as well as on behalf of his principal, and he is required also to pay not only his own tax, but the tax assessed against the principal, out of any of his principal's money coming into his hands. For the first year of tax only the agent is relieved of personal liability in respect of the tax of his principal, but this does not relieve the principal. Before the agent is relieved he must satisfy the commissioner that he has none of his principal's money, and will receive none out of which the tax can be paid, and also that the principal has refused to pay the tax.

It is pointed out by the representatives of British manufacturers that their principals have already to pay a high income tax in the United Kingdom, and that a British manufacturer not represented in Australia would escape the local tax, while those who were represented by agents or travellers were made liable. The obvious difficulty in collect-

ing the income tax, from the Australian representatives of firms in the United Kingdom and other British possessions, is recognized by the Department which has relieved the agent from the responsibility of payment for the first year only, while maintaining the liability of the oversea principal.

In view of the possible development of Canada's export trade to Australia, the foregoing enactment is a matter of special interest.

BRITAIN GETS CONTROL OF FERRO-MANGANESE

AMERICAN manufacturers using ferro-manganese in the manufacture of steel have been asked by representatives of the British Government to dispose of their products containing that constituent only to Great Britain and her allies. The supply of this material is said virtually to be controlled by Great Britain and Russia.

Customers of the Bayonne Steel Casting Co., of Bayonne, N.J., have received from that concern notice that British agents have requested them to have all their customers sign a promise not to export, except to the United Kingdom, France, Russia or Italy, any of the steel products purchased from the Bayonne Co. in which ferro-manganese is employed.

The customers were asked also to agree to notify the British Consul-General in New York of any shipments of steel or steel products containing ferro-manganese to any destination other than Europe or Canada.

A representative of the Bayonne Co. says 95 per cent. of its customers have signed the proposed agreement.

EXPORTS OF LOGWOOD

FORMAL notice has been given the State Department at Washington, D.C., by the British Embassy that the embargo on dyewood exports from Jamaica and British Honduras had been raised, and that the export of the product to the United States would be continued, provided manufacturers there resumed supplying logwood extract to Canadian users on a reasonable scale. A statement from the Embassy announcing this action follows:

"The British Embassy have informed the State Department that the Governor of Jamaica has issued a general license permitting the exportation of logwood chips and extract to the United States as well as to Great Britain, France and Italy, and that the Governor of British Honduras has been instructed to take similar action.

"The export of these materials from British possessions to the United States will, however, only be continued on condition that the supply of extract from the United States to Canada be resumed on a reasonable scale."

CANADIAN COMMERCIAL INTELLIGENCE SERVICE

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

Argentine Republic.

H. R. Poussette, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

Australasia.

D. H. Ross, Stock Exchange Building, Melbourne, Cable address, Canadian.

British West Indies.

E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

China.

J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

Cuba.

Acting Trade Commissioner, Lonja del Comercio, Apartado 1290, Havana. Cable address, Cantracom.

France.

Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

Japan.

G. B. Johnson, P.O. Box 109, Yokohama. Cable address, Canadian.

Holland.

Acting Trade Commissioner Zuidblaak, 26, Rotterdam. Cable address, Watermill.

Newfoundland.

W. B. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

New Zealand.

W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

South Africa.

W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

United Kingdom.

Acting Trade Commissioner, Sun Building, Clare Street, Bristol. Cable address, Canadian.

J. E. Ray, Central House, Birmingham. Cable address, Canadian.

Acting Trade Commissioner, North British Building, East Parade, Leeds. Cable address, Canadian.

F. A. C. Bickerdike, Canada Chambers, 36 Spring Gardens, Manchester. Cable address, Cantracom.

J. Forsythe Smith, Fruit Trade Commissioner, Canada Chambers, 36 Spring Gardens, Manchester.

J. T. Lithgow, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

Harrison Watson, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London.

SPECIAL TRADE COMMISSIONER—LUMBER.

H. R. McMillan, visiting Europe, Africa, Australasia and the Orient.

CANADIAN COMMERCIAL AGENTS.

British West Indies.

Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian.

R. H. Curry, Nassau, Bahamas.

Norway and Denmark.

C. E. Sontum, Grubbeged No. 4, Christiania, Norway. Cable address, Sontums.

South Africa.

D. M. McKibbin, Room 34, Permanent Buildings, Harrison Street, Johannesburg.

E. J. Wilkinson, Durban, P.O. Box 673, Durban, Natal.

CANADIAN HIGH COMMISSIONER'S OFFICE.

United Kingdom.

W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

Made in Canada

$85 and up

Cuts Down Overhead

$85 and up

Why they like the "Dial" Time Recorder

Thousands of manufacturers have told us at one time or another that they prefer the International "Dial" type of Time Recorder, as pictured above, to all others. Recently we made an exhaustive enquiry as to their reasons, and we publish them below, believing they will interest you.

1. The operation of the employee recording his time on the Dial is the fastest in the world.

2. The time slips taken from the Dial Recorder at the end of the pay period give the pay-roll in complete form, already made up, and easily filed.

3. No employee has an opportunity of losing or mislaying the Dial's Record, as it is kept under lock and key during the whole pay period.

4. The Dial Recorder can be more readily moved about from one part of the building to another.

5. One employee cannot see the record of another.

6. The slips from the Dial Recorder can be referred to, months back, being easily filed or pasted in a book.

7. The mechanism of the Dial Recorder is inaccessible to those of meddlesome mind.

8. The necessary stationery for the Dial costs less than any other Time Recorder—meaning less upkeep expense.

9. The Dial Recorder is clean and sanitary to use and the printed sheet cannot be thumbed and soiled by workmen's hands as with cards.

10. Dail Clocks have a long life, there being less vibration and jar when used.

11. It is unnecessary to have any set hour shifts or any particular set of operating hours. Each employee registers in his proper place any time.

12. You can't overload the Dial. It is so quick to use there is no congestion of operatives at registration time.

13. It is impossible to register in the wrong column.

Remember our Guarantee: "We offer $100 reward to anyone who will buy a new International Time or Cost Recorder from the Company or an authorized agent at under list price less our regular discount."

WRITE US FOR PRINTED MATTER, PRICES AND FULL INFORMATION.

The International Time Recording Company of Canada, Limited

TORONTO
Cor. Yonge and Shuter Sts.

F. E. Mutton,
General Manager

MONTREAL
Cartier Building

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

West Lorne, Ont.—Fire on Jan. 20, destroyed the Ontario Gas. Co. regulator building here.

Ottawa, Ont.—The Ottawa Brass Mfg. Co., are considering the erection of an addition to their factory.

Calgary, Alta.—An expenditure of $22,500 on equipment for the civic power plant is contemplated.

Guelph, Ont.—A stove factory will be established here. W. A. Mahoney, of this city, is the architect.

Pembroke, Ont.—The Pembroke Iron Works have taken over the Lee Manufacturing Co., and will make stoves.

Montreal, Que.—The Montreal Public Service Corporation contemplate building an important addition to their power plant.

Regina, Sask.—The Imperial Oil Co. will lay a pipe to the proposed refinery here from Plentywood, Montana, a distance of 160 miles.

Hamilton, Ont.—It is reported that the United Gas & Fuel Co., will proceed with the construction of coke oven and gas plant to cost $2,000,000.

Westport, Ont.—The plant of the Electric Light & Milling Co., has been destroyed by fire. The loss is very heavy and only partly covered by insurance.

Fredericton, N.B.—The Fredericton Electric Co. has been incorporated to take over the assets and business of the Fredericton Gas Light Co. The new company will make considerable extensions to the plant.

General Industrial

Stratford, Ont.—The Avon Hosiery Co. may build an extension to their factory.

Peterborough, Ont. — The Auburn Woollen Mills Co. will make an extension to their factory.

Redcliffe, Alta —The Dominion Glass Co. will make an extension and install a plant for making lamp glasses.

Sackville, N.B.—The factory of the Standard Boot & Shoe Co. has been damaged by fire. Some valuable machinery suffered.

Sarnia, Ont.—It is reported that Lockwood, Green & Co., of Boston, Mass., may build a cotton mill at Sarnia.

Three Rivers, Que.—Constant, Monette & Pion Co., of Montreal, are building a factory here for making chemicals.

Toronto, Ont.—The Gold Medal Furniture Co., will rebuild that section of the plant which was recently destroyed by fire.

Winnipeg, Man.—Fire which started in the basement of the Wainwright Milling Co. building on January 20 completely demolished the big flour mill, with an estimated loss of $28,000.

Municipal

Kamloops, B.C.—The City Council has authorized extensive additions to the street lighting system.

Calgary, Alta.—Fire Chief Smart, in his annual report, recommends the purchase of 5,000 feet of 2½ in. fire hose.

Hensall ,Ont.—The vote on the hydro by-law here last Monday resulted in favor of the by-law by a majority of seventy-five.

Highgate, Ont.—A by-law has been passed authorizing an expenditure of $7,000 on the installation of a hydro-electric system.

Gravenhurst, Ont —The ratepayers passed a by-law authorizing an expenditure of $3,500 on changes to the street lighting system.

Guelph, Ont.—Fire Chief Smith has recommended the purchase of new fire-fighting apparatus and the installation of a new fire alarm system.

Toronto, Ont.—Fire Chief Smith has recommended to the Board of Control that the American Le France Fire Engine Co., of Canada, be awarded the contract for the supply of three 6-cylinder tractors for the sum of $18,381.06. The chief also recommended that the same firm be awarded the contract for the combination hose and chemical motor at the prices of $7,850 and $7,981, but the board decided that before awarding this contract the chief should have a test made of the hose and chemical motors of the White Company and the successful tenderer. The American Le France Co., of Canada were awarded the contract for the tractors.

Tenders

Hullett Township, Ont.—The Township Council will receive tenders until February 3rd, for the construction of a steel bridge over Walkerburn Creek.

Windsor, Ont.—Tenders will be received until January 31 for heating, ventilating and sheet metal work for the new Windsor Collegiate Institute. Particulars may be obtained from the architect, J. C. Pennington, Windsor, Ont.

Toronto, Ont.—Tenders will be received by the Board of Control, City Hall, up to Tuesday, February 1st, for the installation of a train signal system; also special track work for St. Clair Avenue barn extension, Toronto Civic Railway. Specifications may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont.—Tenders addressed to the secretary-treasurer of the board of Education will be received until Friday, January 28th, 1916, for ash hoists, electric wiring, fire doors, steam fittings, at sundry schools. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall.

Hamilton, Ont.—Tenders will be received by the chairman Board of Control, up to February 7, 1916, for supplying mechanical rakes and appurtenances and traveling hoist and grab bucket (one-half cu. yd. capacity) and appurtenances for Gage avenue pumping station. Plans, specifications, and further details can be obtained upon application to the city engineer's office.

Toronto, Ont.—Tenders will be received by the chairman of the Board of Control, City Hall, Toronto, up to Tuesday, February 1st, 1916, for the supply and delivery of a number of street cars complete, bodies, trucks, motor equipment, air-brake equipment, copper cables for street car work, and fare boxes. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont —Tenders will be received up to Tuesday, February 1st, 1916, covering the extension of cold storage division at the city abattoir. Specification may be seen and tender form obtained, together with all information relative thereto, at the office of the Department of Property, City Hall, or upon application to D. W. Wright,

JOHNS-MANVILLE SERVICE

JOHNS-MANVILLE SERVICE COVERS THE CONTINENT

YOUR assurance of quality in J-M Products is two-fold; first, the reputation of the concern which sells them—and second, the principle of responsibility, which not only reinforces the quality of the products but assures all responsibility for their performance.

J-M Products involve no experimenting—you run no risks, and therefore there is no waste.

There may be a hundred heat insulators that will cover your pipes—but only one that will insulate them.

It is our business to investigate the problem of heat insulation in your plant and recommend the proper material. We can do this impartially, too, because of the variety of insulations we make and install.

There is another important feature covered by this service that should not be overlooked, and that is the proper application of the insulation.

Probably the best recommendation we can offer the engineer as to our efficiency in this line is to say that we maintain specialists all over the country, whose experience has been the broadest—and that our contract departments are made up of men who are experts in the application of various insulations.

Why not let us talk over your work with an idea of making the thermal efficiency of your plant a record breaker?

J-M Asbestos-Sponge Felted Pipe Covering—One Style of J-M Heat Insulation.

J-M Mastic Flooring—Dustless, Noiseless, Damp-proof

Racking Room, Wacker & Birk's Brewery, Chicago.

J-M Mastic Flooring, besides being waterproof, is entirely unaffected by acids, alkali and brine. It will not create dust and is practically wear-proof. Its resiliency, in addition to obviating footsoreness, deadens sound.

For best results mastic floorings should be modified to meet the special requirements of each installation.

The specialized experience and skill of J-M Service in this respect is largely responsible for the high efficiency developed by many large J-M Mastic Flooring jobs.

J-M Service will gladly co-operate with architects on any flooring proposition. Get complete J-M Mastic Flooring facts—now.

THE CANADIAN H. W. JOHNS-MANVILLE CO. LIMITED

688

TORONTO WINNIPEG MONTREAL VANCOUVER

manager of the civic abattoir, Tecumseh street.

Toronto, Ont.—Tenders will be received by the Board of Education, up to Friday, January 28th, for ash hoists, electric wiring, fire doors, steam fittings, at sundry schools. Specifications may be seen at the office of the Superintendent of Buildings, City Hall.

Departmental Dredging Plant—Separate sealed tenders addressed to R. C. Desrochers, Sec'y. Department of Public Works, Ottawa, will be received until February 15, 1916, for the supply of Brooms and Brushes, Chain, Coal, Hardware, Hose, Oils and Greases, Packing, Paint and Paint Oils, Manila Rope, Wire Rope, Steam Piping, Valves and Fittings, for the requirements of the Departmental Dredging Plant in Ontario and Quebec during the fiscal year 1916-1917. Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures. These forms can be obtained at the Department of Public Works, Ottawa.

New Incorporations

The Grest Brothers Lumber Co., has been incorporated with head office at Watrous, Sask., with a capitalization of $50,000.

The T. Eaton Co., of Toronto, has been incorporated under Saskatchewan Provincial laws as a limited company, with a capitalization of $1,000,000.

The Welland Gas Co. has been incorporated at Toronto, with a capital of $40,000, to acquire and develop oil and gas lands and deposits. Head office at Welland, Ont. Incorporators: D. M. Burnham, R. Ramsey and H. A. Rose, all of Welland, Ont.

The Algoma Rolling Stock Co. has been incorporated at Toronto, with a capital of $40,000, to manufacture locomotives, cars, rolling stock, etc. Head office at Toronto, Ont. Incorporators: T. Gibson, A. Taylor and J. Gibson, all of Toronto.

The Sable River Copper Co. has been incorporated at Toronto, with a capital of $100,000, to acquire and develop mineral lands and deposits. Head office at Toronto. Incorporators: J. M. Godfrey, T. N. Phelan, and J. E. Corcoran, all of Toronto.

The Garland Manufacturing Co. has been incorporated at Toronto, with a capital of $100,000, to manufacture all kinds of machinery and tools, etc. Head office at Hamilton, Ont. Incorporators: F. Smoke, J. Grayson Smith, and N. Sinclair, all of Toronto.

The Kittinger Gas Co. has been incorporated at Toronto, with a capital of $40,000, to acquire and develop mineral lands and deposits. Head office at Fort Erie, Ont. Incorporators: J. Kittinger, C. McHenry and D. Olsen, all of Buffalo, N.Y.

The Willys-Overland, Ltd., has been incorporated at Toronto with a capital of $6,000,000, to manufacture automobiles, motors, engines at Toronto. Incorporators: James S. Lovell, Charles Delamere Magee, and William Bain, all of Toronto.

The McCooe Rail Anchor Co. has been incorporated at Toronto, with a capital of $40,000, to manufacture mechanical devices of all kinds. Head office at Toronto, Ont. Incorporators: C. Millar, D. McCooe, and J. J. Beck, all of Toronto, Ont.

The Sydenham Mica & Phosphate Mining Co., has been incorporated at Toronto with a capital of $50,000 to acquire and develop mineral lands and deposits at Kingston, Ont. Incorporators John Teas Le Fever and Daniel Francis Dennis, of Kingston, Ont.

The Canadian Bronze Powder Works, Ltd., have been incorporated at Ottawa, with a capital of $500,000, to manufacture bronze powders and other materials at Montreal. Incorporators: R. E. Thorne, E. Coughlan, and T. B. Gould, all of Montreal.

The De Sales Mfg. Co. has been incorporated at Ottawa, with a capital of $10,000, to manufacture cloth, jute and cotton bags, etc. Head office is at Montreal, and the incorporators are Jacob Y. Fortier, A. Wilfred Muhlstock, and J. Charles Duhamel, all of Montreal.

The Eau Claire Water Works Co., has been incorporated at Toronto with a capital of $40,000 to construct and maintain works for supplying water in the Township of Sandwich East at Tecumseh, Ont. Incorporators: Adhelme Jacques, Joseph Alexander Gouin and Fred C. Chadd of Sandwich East, Ont.

The Derby Telephone Co., has been incorporated at Toronto with a capital of $10,000 for the construction and equipment of telephone systems at Kilsyth, Ont. Incorporators, John Henry Moore, William Johnston and Alexander S. Donald, all of the Township of Derby, Ont.

The Precision Tool & Machine Co. has been incorporated at Ottawa, with a capital of $50,000, to manufacture machinery of all kinds, particularly gauges, tools, arms and munitions, etc. The head office is at Montreal, and the incorporators are John J. Meagher, Henry N. Chauvin and James E. Conlin, all of Montreal.

Railways—Bridges

Islington, Ont.—Etobicoke and Toronto Townships vote on Hydro-radial bylaws on February 12.

Brantford, Ont. — The Brantford Municipal Railway Commission will make application to the Dominion Parliament to extend the Grand Valley Railway to the Village or Cainsville, three miles south of the present terminal.

Contracts Awarded

Sherbrooke, Que.—The contract for supply of a turbine has been let by the city council to the Jenckes Machine Co., of Sherbrooke.

Toronto, Ont.—The Board of Control has awarded the contracts for the supply of 7,000 feet of fire hose for the Fire Department to the Gutta Percha and Rubber Co., 2,900 feet; Dunlop Tire & Rubber Goods Co., 2,900 feet; Goodyear Tire & Rubber Co., 1,200 feet.

Toronto, Ont.—The Board of Control have decided to recommend to the City Council that C. J. Townsend be awarded the contract for the erection of the reinforced concrete bridge on Mount Pleasant road at $45,000. The steel contractors withdrew their tenders, the lowest of which was $12,000 less than the tender for reinforced concrete.

Building Notes

London, Ont.—The Oddfellows have bought property on Dundas Street, on which they intend to erect a handsome and up-to-date building.

Toronto, Ont.—The Robert Simpson Co. will build a large warehouse and stables of reinforced concrete at the corner of Wilton avenue, and Dalhousie street. The cost will be approximately $400,000.

Wood-Working

Trenton, Ont.—The Trenton Cooperage Mills were damaged by fire last week to the extent of $15,000.

Calgary, Alta.—The large sawmill at McGillvray, B.C., owned by the Riverside Lumber Co., of this city, has been totally destroyed by fire. The loss is estimated at $65,000.

Personal

F. S. Lewis has been appointed president of the Orillia, Ont., Board of Trade.

Hon. Col. Frederic Nicholls has resigned as acting president of the Dominion Steel Corporation.

John A. Wheaton, a veteran railway contractor, died suddenly on January 21 at St. John, N.B., aged 78.

Walter S. Carter, Vancouver manager for Fittings, Ltd., of Oshawa, Ont., was killed in a railroad wreck recently.

Arthur Hewitt, general manager of the Consumers' Gas Co., Toronto, has been elected president of the Toronto Board of Trade for the ensuing year.

F. J. Sleght has been appointed general manager of the Willys-Overland, Ltd., Toronto. Mr. Sleght was formerly manager of the company's factory at Elyria, Ohio.

H. H. Vaughan, vice-president of the Montreal Ammunition Co., has been elected a director and a vice-president of the Dominion Bridge Co., Lachine, Que., to fill the vacancy caused by the retirement of C. B. Gordon from the Board.

W. S. Forster, of Alexandria, Ont., has been appointed factory inspector for the eastern district, with headquarters at Ottawa. He succeeds Mr. Kielty, who died some months ago. Mr. Forster has been foreman in carriage works at Alexandria for quite a number of years.

Robert Paton Dawson, for some time foundry superintendent with H. R. Ives & Co., and for 18 years machine shop foreman with J. & R. Weir & Son, Montreal, died in that city recently at the age of 67. Mr. Dawson had more recently been engaged in business at St. Hyacinthe, Que.

F. J. McMulkin has been appointed chief engineer at the High Level Pumping Station, Toronto, in succession to the late Thos. J. Walsh. The appointment, we understand, has been made subject to it conforming with the salary grading by-law. The salary is $2,000 per annum and a free house.

Frank D. Lyman has taken over the railway and supply department of the business of John Millen & Sons, Montreal, as from January 1, 1916. Mr. Lyman has been manager of this department since its inception some nine years ago, and purposes conducting same on his own behalf along practically similar lines as heretofore. Meantime the new firm name will be Frank D. Lyman, but as soon as a Dominion charter has been granted, Lyman & Lyman, Ltd., will be the business title. The head office and warehouse will be located at 323 St. James Street, Montreal, while a branch will be established at 90 Adelaide Street, Toronto. Stocks will be carried at both addresses.

John A. Hill, president of the Hill Publishing Co., New York, died suddenly on Jan. 24, while riding in an automobile from his home at East Orange, N.J., to his office on Tenth Avenue, at 36th Street. Mr. Hill, who was 58 years of age, was particularly interested in the metal-working and power plant spheres of industry, his company being the publishers of the widely read journals, "American Machinist" and "Power."

Trade Gossip

Skagway Ships Magnesite.—According to reports from Skagway, Alaska, shipments are being made from large deposits of magnesite in that locality as a result of the European war.

The S. F. Bowser Co., Toronto, has been awarded the contract for the installation of 10 standard gasoline equipments at city fire halls, at a cost of $1,780, by the Toronto Board of Control.

Montreal, Que.—The Board of Trade elected the following officers for the ensuing year: President, H. B. Walker; 1st vice-president, Zeph Herbert; 2nd vice-president, Anson McKim; treasurer, P. D. Gordon.

Welland, Ont.—At the meeting of the Board of Trade, the following were elected by acclamation: President, John Goodwin; vice-president, Blake L. Booth; treasurer, F. H. Pope; secretary, J. D. Payne.

Algoma Steel Co. — According to a New York report, an order for 30,000 tons of 85-pound section rails has been placed by a Canadian railroad with the Algoma Steel Co., the Lake Superior Corporation subsidiary.

Calgary, Alta.—At the annual meeting of the Board of Trade, the following officers were elected: President, F. M. Black; first vice-president, W. G. Fowler; second vice-president, J. H. Walker; third vice-president, T. A. Hornibrook.

Halifax N. S.—The following were the officers elected for the Board of Trade during the coming year.

President, G. W. Hensley; vice-presidents, W. S. Davidson, D. Macgillivray; Council, W. T. Allen, C. J. Burchell, K. C., F. J. Cragg, M. O. Crowell, J. Norwood Duffus, E. J. Murphy, Gavin L. Stairs, I. C. Stewart, H. R. Silver.

Cornwall, Ont. — The annual meeting of the Board of Trade was held recently

when the following officers for the year were elected: President, A. E. Currie; vice-president, J. A. Chisholm; secretary, J. C. Alguire; Treasurer, E. O'Callaghan.

Gananoque, Ont.—The officers of the Board of Trade are as follows: President, A. W. Taylor; first vice-president, C. Sine; second vice-president, M. McParland; secretary, C. A. Watt; hon. presidents, Sir Thomas White, Senator Col. Taylor, Charles MacDonald, C.E., F. J. Skinner and Dr. E. L. Atkinson

Hamilton, Ont.—At the annual meeting of the Board of Trade the following officers were elected and installed: Walder Parke, president; G. C. Martin, vice-president; E. Brown, secretary-treasurer; H. L. Frost, G. C. Coppley, Wm. Gastle, A C. Garden, B. R. Carey, Russell Kelly R L. Smith and H. C. Beckett, councillors.

German Iron Output.—The output of pig iron in Germany in December, 1915 was 1,020,144 tons, as compared with 854,186 in December of 1914. The production in 1915 was 11,790,199, against 14,339,852 in 1914. During the twelve months from August of 1914 to the end of the following July the production was 10,135,329 tons.

Plant for Making Dyestuffs.—The Executive Committee of the Tanners' section of the Toronto Board of Trade advised that all tanning plants in the Dominion get together to discuss the advisability of establishing plants in Canada for making extracts and dyestuffs for tanning purposes, as the war had seriously affected exports.

West St. John, N.B.—Export traffic from West St. John, N.B., during December showed a heavy increase over the corresponding month last year. During December, 1914, twenty steamers cleared, carrying 60,346 tons and 1,262 horses, while in December, 1915, thirty-eight steamers cleared, carrying 181,370 tons and 1,166 horses.

Contracts to Give Out.—The Ross Rifle Co., Quebec, has contracts to give out on small work interesting to manufacturers of sewing machines, tele phones, phonographs, typewriters, etc. Those applying for contracts are asked to furnish number, style and size of machine for which they desire work. The company is desirous of placing the contracts with Canadian firms.

Calgary, Alta.—North American Collieries, Ltd., a syndicate of Eastern capitalists, mostly from Montreal, have bought the property and assets of the Canadian Coal & Coke Co., an Alberta mining concern, for $3,000,000. The Canadian Coal & Coke Co's. properties were sold to satisfy a judgment, and

"Keystone Quality"

"KEYSTONE"
200-M Combination Ratchet

4 complete Ratchets in one. All parts interchangeable.

KEYSTONE TOOLS

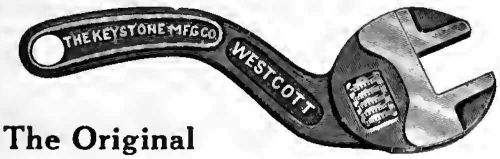
are endorsed by the best of mechanics

They have the utility, strength and convenience that make them the choice of all who know.

THE TOOLS YOU'LL APPRECIATE

Supplied by any better class wholesale house. May we refer you to our dealer nearest to you?

THE KEYSTONE MFG. CO.
BUFFALO, N.Y.



The Original "WESTCOTT" Adjustable "S" Wrench

HANDLE MALLEABLE IRON, JAW FORGED STEEL.

The "Westcott" Wrench is acknowledged to be the most convenient and useful wrench for general use, and can be used in many places inaccessible to the Monkey Wrench. These wrenches are made of first-class material, are strong and durable.

The genuine "Westcott" Wrenches have the trade-mark "Westcott" on the handle.

KEYSTONE "Model K" Wrench

All drop-forged steel.
No. 1—Polished all over.
No. 2—Polished Head—Enamelled Handle.
Look for the trade-mark "Keystone" on the handle.

Thousands of Threaded Pieces Each Day with a

GEOMETRIC THREADING MACHINE

Rapid and Perfect Duplication

Takes floor space 2 ft. x 3 ft., and is complete with countershaft, change speed gear for adapting speed of spindle to diameter to be threaded; adjustable stop for gauging length of work.

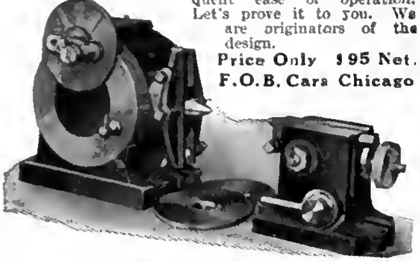
No rough threads with the Geometric. They are as true and clean as can be produced by any screw machine.

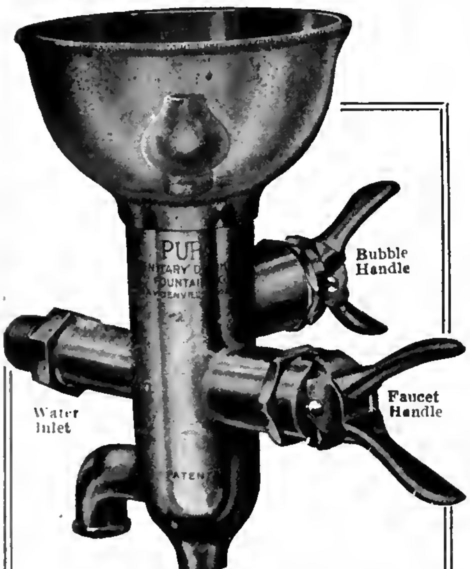
Note the range:—Regularly, $\frac{1}{4}$-in. to $\frac{3}{4}$-in. Specially, $\frac{1}{2}$-in. Std. pipe threads; $\frac{7}{8}$-in. S.A.E. Std. Spark Plug threads, and up to 2-in. Diam. threads where the pitch is fine. Internal threads, $\frac{1}{8}$-in. to 2-in.

Send in your Specifications and learn what we can do for you.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN, CONN., U.S.A.

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.





bought in by the bondholders organized as a new company.

Toronto-Hamilton Road—On account of the excess of cost over the original estimate, it is reported that legislation will be introduced at the coming session of the Ontario Legislature for about $300,000 more for the Toronto-Hamilton highway. It is stated the road will cost, when completed, about $850,000 or $900,000.

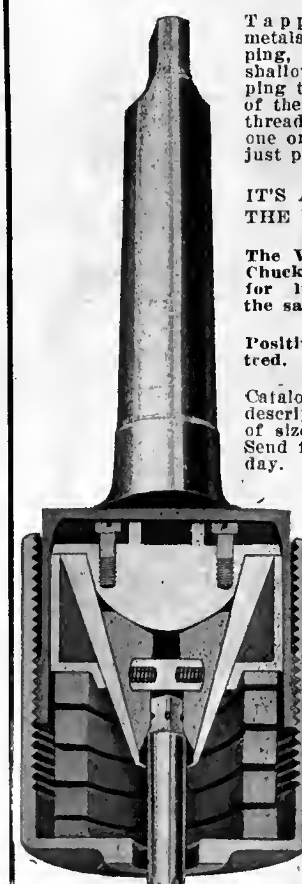
Niagara Falls, Ont.—The Niagara Falls Board of Trade, at its annual meeting on Jan. 18, elected these officers:—President C. C. Cole; vice-president, James Orr; secretary-treasurer, J. A. Newport, councillors, J. J. Bampfield, J. C. Gardner, J. L. Vanstone, Dr. Olmsted, J. L. Dawson, Georg Mayhew, J. R. Wilson, Sidney Burrows and J. Carroll.

Platinum Deposits in Spain—Platinum deposits recently discovered in Spain and said to be among the richest in the world, have been turned over to the government by the discoverer, according to Consul Robertson Honey of Madrid. Chromium and nickel are also present. Concessions to exploit these mines are to be granted to foreigners as well as Spaniards.

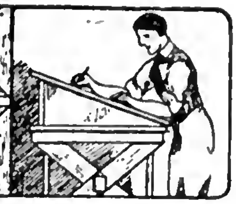
Wire May Advance.—Advices from New York state that another advance in the price of wire products is probable. The plants of the American Wire Co. are operating full, and a large amount of business has been refused. The sales agents have nothing to do owing to the unprecedented demand for wire. Certain wire companies have been forced to refuse foreign business, as they are unable to supply the domestic demand.

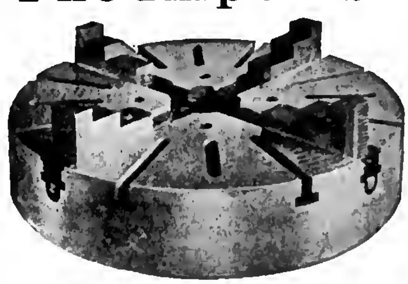
Toronto, Ont.—At a meeting of the Willys-Overland, Ltd., held on Jan. 19, the following officers were elected: John N. Willys, president; C. A. Earl and T. A. Russell, vice-presidents; Walter Stewart, treasurer; F. J. Sleght, secretary and general manager. Directors elected were: John N. Willys, Harry T. Dunn, Walter Stewart, Harry Shepler, F. J. Sleght, C. A. Earl, T. A. Russell, Lloyd Harris, Mr. Scofield.

Restrict Imports and Release Ships—According to The Standard, the Imperial Government is preparing to make sweeping recommendations to the House of Commons for restriction of importations in order to relieve the strain on shipping. The first list of articles to be excluded will include automobiles, building materials and fruit, all of which are bulky in proportion to their weight and, therefore, require much space in ships. If a sufficient number of ships is not released by February 1, the list of prohibitions will be extended.



PROFESSIONAL DIRECTORY





Fancy Prices for Steel.—It is reported from New York that the demand for steel is without a parallel. Consumers are clamoring for material and seem to be willing to pay all kinds of prices for delivery within a reasonable period. Foreign consumers are bidding $10 to $15 a ton above current quotations. A steel manufacturer, who is in close touch with the situation, says the belligerent nations look for another year of war at least.

Low Rates Sought on Scrap.—The Dominion Government has been asked by Western Canadian interests to establish a low rate on scrap iron from points in the West to iron and steel mills in Eastern Canada. The market for this iron has been in the United States, but this has been shut off by the war embargo, and shippers are anxious to find a new market for scrap iron in the Eastern provinces, particularly in Ontario.

Premiums for Steel.—Premiums for steel are larger than they have ever ben in history, says the Wall Street Journal. In certain cases premiums range as high as $25 a ton. For barb wire premiums run from $15 a ton up. Most of the steel companies have sold their possible production of the first half of the current year, and capacity available for the last half of the year is comparatively small, Earnings of the steel companies for the first half of this year, as a result of rising prices, are expected to surpass the most optimistic predictions.

Flax Growers Seek Government Aid.—Western Ontario flax growers are arranging to see the Government this week with a request that the flax growing industry be given some form of special encouragement. It is proposed that the secretary of the Flax Growers Association be given official recognition so that he could go about the various factories, in Ontario, and encourage the use of flax fibre. The deputation of flax growers will be introduced by S. F. Glass, M.P., John Merner, M.P., and other members of the House, and will see Hon. Martin Burrell, Minister of Agriculture.

The Canadian National Clay Products Association recently held its 14th annual convention in Toronto, and elected the following officers for the ensuing years: Past president, Charles A. Miller, Toronto; president, J. Edward Frid, Hamilton; 1st vice-president, A. F. Greaves-Walker, Toronto; 2nd vice-president, Thomas Kennedy, Swansea; 3rd vice-president, William Burgess, Todmorden; secretary-treasurer, Gordon C. Keith, Toronto. Councillors—C. B. Lewis, Milton; A. Lochrie, Toronto; A. Neil, Kingston; John S. McCannell, Milton; Ryland New, Hamilton; T. Desjardins, T. Graham, Inglewood, and W. Clarke, of Sarnia.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV, TORONTO, FEBRUARY 3, 1916 No. 5

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President H. T. HUNTER, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY

PETER BAIN, M. E., Editor.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

B. G. NEWTON - - - - - - Advertising Manager

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—London, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 140 So. Dearborn St., Room 607, Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Opportunities for Canada's Industrial Development--II.

By C.T.R.

In this series of articles prepared in response to numerous inquiries received from the managements of Canadian metal-working plants on the subject of post-bellum employment for their added equipment and enlarged capacity arising from an extended period of shell production, we aim to give prominence to the opportunity to manufacture such products as were previously imported for our domestic needs or have since become available for export.

WHILE presumptions based on the concluding quotation of the previous article might suggest the probability of a serious reduction in the proportion of imports from the United States, such an event is remote. The immediate efforts of our producers will naturally be confined to those lines which are suited to the recent plant extensions and therefore will be largely in the machinery, hardware, and allied trades. That certain particular imports may decline in course of years is possible, but if the development of this country, as an outcome of present world conditions, takes place on a similar relative scale as on past occasions, the total amount of United States imports may easily show a very considerable increase.

At the present moment the chief desire of ninety per cent. of our manufacturing firms is to know what to start making. The second and third classes of group one* form the great proportion of this number. With some of them circumstances have so developed that to return to their former fields would in a sense be a retrograde movement, and equivalent in a way to throwing up the sponge before the first round had commenced. Many of their employes are men who never handled a machine tool in their lives before circumstances forced them to turn to munitions work. These men have all the enthusiasm of youth, plus the judgment of older heads and the freshness of their viewpoint on manufacturing work generally makes them a valuable asset to the industry of the country. Their employers may well be excused if they betray an anxiety to retain these men in their factories.

Prospects of Home Competition

The formerly established firms referred to as class one* have retained all or part of their sales force in existence prior to the war, and with this as a nucleus have kept in touch with, and in some cases have considerably enlarged their previous business. The utilization of their surplus plant in the approaching future will probably direct their efforts into new channels so that all three classes in group one are probable competitors. That all of these firms will choose identical spheres of activity is hardly probable and the abstract of principal imports from the United States for the year ending March 31st, 1914, will indicate the wide range of manufactures directly connected with the machinery trade.

*See article in previous issue.

Immediately Available Markets

All of the items selected from the complete report call for machinery in their manufacture, many of them require raw materials either unobtainable in this country or whose gradual development would ultimately result in the establishment of allied or interdependent industries. The items have all been selected with a view to an already existing market of sufficient demand to give a start to several plants in some cases, while the amount of trade in other items might easily justify the starting of a new department in other shops.

SELECTED IMPORTS.

(1)	Artificial limbs and parts thereof	$ 40,621
(2)	Asphaltum or asphalt	635,278
(3)	Baking powder	206,390
(4)	Baths, bath tubs, basins, closets, lavatories, urinals, sinks and laundry tubs of any material	288,714
(5)	Braces or suspenders and finished parts thereof	67,248
(6)	Bricks, clays and tiles—	
	Building blocks, partition hollow and fireproof building tile	$ 375,796
	Building bricks	499,596
	China clay	96,251
	Fire bricks	890,146
	Fire clay	100,676
	Paving bricks	98,471
	Drain pipes, sewer pipes and earthenware fittings therefor, chimney linings, etc.	399,830
	Other bricks, clays and tiles	243,660
(7)	Buttons and materials for	$ 465,021
(8)	Carriages, carts, wagons, etc.— *See note.	
	Children's carriages and sleds	$ 402,544
	Farm and freight wagons	417,498
	Scrapers, railway or road	114,830
	Wheelbarrows, trucks and hand carts	119,844
	Other carriages and parts thereof	156,970
	Total items as above	$1,211,686
(9)	Clothes wringers and parts thereof for domestic use	$ 33,999
(10)	Binder twine	3,779,434
(11)	Electric apparatus, total †See note.	7,505,244
(12)	Toys and dolls of all kinds	293,853
(13)	Glass and mfrs. of, total	2,094,459
(14)	Gutta percha, India rubber and mfrs. of total	6,137,122
(15)	Jewellery	1,001,258
	Metals and minerals and mfrs. of	
(16)	Brass—	
	Glove fasteners of metal, shoe eyelets, corset eyelets, shoe eyelet hooks, shoe lace wire fastners	$ 184,562
(17)	Iron—	
	Anvils and vises	43,531
	Butts and hinges	136,006
	Cutlery	246,481
(18)	Machinery—	
	Gasoline and gas engines	2,456,507
	Sewing machines and parts of	450,033
	Washing machines, domestic	83,122
	Pumps, hand	88,560
	Sheets, flat, galvanized	1,018,536
	Stoves of all kinds, for coal, wood, oil, spirits or gas	319,740
	Total items tabulated	$31,991,831

Total value of principal and other articles of merchandise imported from United States—

Fiscal year 1914	$395,565,328
" " 1913	435,770,081
" " 1912	330,428,502
" " 1911	274,844,858
" " 1910	217,502,415

Note: Automobiles and parts thereof, carriages, buggies, etc., and railroad cars, etc., are not referred to here as their manufacture requires large capital outlay, while conditions pertaining to the securing of contracts do not render this work attractive to the small producer.

Note: Although Canadian firms produce a large amount of electrical plant, there is a large import trade in special apparatus, either of large size or for peculiar requirements. The amount stated shows the volume of this extra demand.

Consideration of Separate Items

(Items 1, 2, 3.)—These are mentioned as samples of products which will constantly increase and which by reason of their nature or method of production may appeal to manufacturers.

(Item 4.)—The production of enamelled iron bathware, etc., is somewhat specialized and calls for considerable knowledge, but a great amount of plain cast iron fittings such as sinks for all purposes, troughs, stable and cowshed fittings and the commoner types of closets, etc., for hard service in public use, are well within the scope of many foundry establishments.

(Item 5.)—The number of braces and suspenders required to equal $67,000, calls for an amount of stamped metal work which would keep a fair-sized department quite busy the most of the year. Shops with suitable equipment in the way of presses should secure the widest range of samples, and when certain of their ability to produce, should endeavor to interest a soft goods establishment to combine in supplying the fabric parts and disposing of the product through jobbers or otherwise. These fittings are nearly all well made and finished and new articles should if possible possess some novel feature or slight improvement. In all cases they should be at least equal to existing goods.

(Item 6.)—Several of the products included in this item are already made here but the volume of imports is very large. Special kinds of fancy bricks sold

under a well advertised brand have a strong hold on the market, but the widespread adoption of paving bricks in the States is meeting with a success which if duplicated here should mean good business.

(Item 7.)—The successful production of fancy buttons depends on careful anticipation of fashion demands, and the obtaining of suitable materials. The quantity of any one design which must be made to secure economy of production demands a large market, and export business would have to be figured on in this connection. The cheap grades of metal, bone, and composition buttons which allow of factory methods being employed should offer a fair field of activity.

Children's Requirements Large

(Item 8.)—The amounts included in this item cover a number of lines, which although classified together, represent lines which differ sufficiently in nature to allow of their being treated as separate industries. The first amount covering children's carriages and sleds offers possibilities to woodworkers and metal stampers. The design and manufacture of wooden and wicker bodies would call for additional output from firms already in that line, especially wicker work which requires specially trained workers. The production of wooden bodies could be undertaken with less hesitation, designs and styles being more or less standardized. Running gear for such vehicles is nearly all metal, and if the design of axles, wheels and springs be carefully gone into from a manufacturing point of view, so as to allow of various combinations of size and type, it would seem possible to specialize in producing running gear for assembling by different body makers. With sufficiently large production, costs could be kept well down, and a reasonable proportion of imports of these goods would afford ample business for more than one new comer. Several types of collapsible carriage are practically all metal and include some patented designs. As a manufacturing proposition they should appeal to firms doing light and medium press work and possible improvements on existing designs might result in remunerative patents being evolved by makers whose ideas are fresh. The demand for sleds is a dependable annual occurrence; this is largely a woodworking proposition.

Farm and freight wagon imports amount to a very large sum, while wheelbarrows, trucks, etc., form a considerable proportion also. The increasing use of transfer trucks is proof that the merits of this apparatus are being recognized. Elaborate designs involving motor drives, power elevation, and the use of trailers, have been developed for special work, but a considerable market will always be available for the simpler hand operated trucks of reasonable cost.

Domestic Goods

(Item 9.) These goods are closely allied to domestic washing machines and should really be considered with them. The sum of $117,000 represents a considerable amount of business in imports alone irrespective of similar goods made in this country. Both of these lines should find many willing producers. Recent years have seen the production of all metal washing machines for which certain advantages are claimed.

(Item 10.) The value of binder twine imports would suggest that United States producers have a strong hold on this market. This is no doubt due to the handling of twine by the harvester manufacturers who find this a convenient means of increasing their turnover. These firms are in a position to influence farmers in their purchases of twine and prospective entrants into this field would have to be prepared to give a large proportion of the tariff advantage to the consumer while offering an article fully equal to, if not better than the imported.

(Item 11.) The successful production of many electrical goods, especially accessories has been favored in the States by the great number of users in the large centres of population. While the tendency towards a similar condition in this country may suffer a noticeable check due to possible retrenchments during the continuance of hostilities, the very favorable rates for current which exist in many localities affords a full appreciation of the advantages and convenience of electricity for many purposes. A great factor in the accessory business is the ability to get out novel designs and applications. Stamping work and plating enter largely into much of the work, but a knowledge of trade tendencies and requirements is essential if the producer has to handle sales of the finished article. In some cases it may be that the actual making of the parts or the performing of some special work may be undertaken by small shops suitably equipped, the originating of designs, assembling, and sales being taken care of by a firm already in the business and desirous of increasing its turnover without further capital investment. Such work can be obtained by persistent endeavor, either by personal investigation and following up possibilities for full information, or by continued advertising so that when such work is required the producers' name is immediately associated with it.

Toy Possibilities

(Item 12.) The value of imports in this field is amply large to warrant serious consideration by shops having metal stamping equipment. Toys of a mechanical nature will naturally have first call especially when their manufacture occupies existing machines. National sentiment, of course, will prohibit German goods for years so that dealers and jobbers formerly handling these goods are either out of business or making new connections with other producers. Their advice should be obtained regarding designs and ideas and a collection of former good sellers made so that careful study of the attractive features may help towards producing new models and types.

Doll heads and animal toys calling for press work and autogenous welding indicate a recent tendency which is capable of development by efficient study and effort.

(Item 13.) The available business in this class appeals principally to firms already in the trade. Much of this business is in special material for lighting, etc., where established reputation, high quality of product, and manufacturing skill and experience are important factors. While no new entries are looked for, the amount of trade indicates possibility of extension.

(Items 14 and 15.) These items are of general interest only. The former is in the hands of firms operating on a large scale, whose products are in steady demand in certain branches of engineering activity: belting, packing, jointing, etc. The increased production of certain classes of jewelery might offer openings for die sinking work.

(Item 16.) These goods are of interest to metal stampers who already possess press equipment capable of being adapted to the work. Besides being produced by multiple punches, etc., they require a considerable degree of accuracy so that they may be fixed in the goods by special apparatus without trouble due to variation in size. Building up a connection in this line would call for considerable investment in time, tools, and advertising such as could hardly be expected from very many firms just now. The business is there, however, if it be considered worth trying for.

Machinery Products

(Items 17 and 18.) The various imported manufactures of iron, steel, and machinery are well known to all of our metal working concerns, and that fact alone renders a detail statement unnecessary. The total value of metals, minerals, and many manufacturers thereof amounted to $121,251,081 during the period under review. The few entries given are selected either because of their possible future appeal to munition makers pro tem. or because of obvious simplicity of manufacture or amount of demand. Anvils and vises

vary somewhat, but suitable material in both cases is essential; there is no obvious reason why this material cannot be supplied by foundries or forges in this country. Machine work is absent on anvils, and vises call for flat work on milling machines and planers principally, but in either case substantial articles must be produced with sound materials and reliable workmanship if any increased business is to be obtained.

Engines for gasoline and gas indicate a large annual consumption and their production could be well undertaken by many existing munition plants. It might be well to mention here that the general degree of accuracy called for on shells does not begin to approach that required for first class engine work, and many new firms who found government work irksome had best leave such engine work alone as they will be just as disappointed as some of their ultimate customers. Previously established machine shops doing work to specifications, and building special machines for various trades will, as a result of quantity production of shells, be in possession of most suitable experience for engine production and even in some cases of sewing machines.

The production of galvanized sheets was only recently begun in this country, while the stove industry is already well established.

Making a Choice

Before a definite decision can be made regarding the taking up of new work, all possible information should be obtained regarding the channels through which the output must be disposed. Many shops are now suitably equipped and possess skilled labor and management which would enable them to successfully attack various propositions if production were the only factor in the situation. Even when it is known that a demand exists for a certain article, the firm which has the best knowledge of the market will have the best chance of securing the work even though its production methods may be much inferior to its competitors. This feature is therefore even more important than the producing problem because the present and prospective state of affairs makes the securing of orders a matter of more importance than the extraction of excessive profits.

What then must a typical concern do at the present moment to maintain its present and insure its future existence?

Assuming that a list of suitable articles has been compiled the consumption of which is large enough to offer prospects of business, it becomes a matter of getting orders. Articles such as machine shops produce may be classified thus: First, those which can be sold directly to consumers, thus demanding a sales and advertising department; second, those which can be sold to jobbers or wholesalers who distribute to retail stores; third, those suitable for disposal through the large supply houses, whose selling staff are disposed throughout the country and handle a selection of articles.

While the first class may offer the greatest prospective profits, the line of goods selected must be suited for quick sales, otherwise an extended expenditure in salaries and advertising space must be faced. Chucks, vises, belt fastening devices, tool holders, cutters, lubricant pumps, flexible couplings, universal joints, drill chucks, gauges of all kinds, and the smaller kinds of machine tools, lubricators, belt shifting devices and safety appliances are some of the lines which can be taken up by small shops and marketed to the metal working trades. Class two includes lines of a more specialized nature and acceptable to the public in general such as wrenches, pliers, machinists' tools, scales, and the bulk of small hardware produceable in the average machine shop equipped with presses and welding apparatus. Class three includes such engineering supplies as are handled by the concerns referred to. These would include several of the lines in class one, together with articles which are sold from stock.

The entire situation cannot be reviewed from a standpoint which will apply satisfactorily to all. Each individual manufacturer will form his own ideas as a result of former experience and personal inclination. If this is further qualified by a persistant inquiry and careful study of present conditions and tendencies, and the reasons therefore, such parties will be assured of a reasonable share of this country's trade, and in the near future will be able to approach the question of export work well supported by suitable products, and the knowledge and means for marketing them.

EXPERT FOR DOMINION STEEL

IT is understood that one of Mark Workman's first acts as president of the Dominion Steel Corporation will be to secure a first-class man to assume direction of the practical side of the corporation's operations at Sydney.

Mr. Workman leaves for New York this week, and if he is successful in his mission, the new expert may be nominated to the vacancy now existing on the board, and possibly given a vice-presidency. Mr. Workman proposes to devote practically all his time to the affairs of the corporation, although his headquarters will be in Montreal. He will be concerned with the broader aspects of management, rather than with technical details. The right kind of a technical man at Sydney, it is believed, would do much to advance the interests of the corporation, and a move of this kind will meet very general approval.

The directors in attendance at the meeting, when Mr. Workman was elected to the presidency, were: J. H. Plummer, Mark Workman, George Caverhill, Sir William Mackenzie, Hon. David Mackeen, Senator Mackay, Senator Dandurand, W. G. Ross and William McMaster. The vice-presidents of the corporation now are Col. Frederic Nicholls, William McMaster and Col. Henry M. Pellatt, C.V.O.

MUNITIONS ORDERS IN UNITED STATES

THE Wall Street Journal of January 28 estimates that orders for war munitions placed in America aggregate \$2,000,000,000. It gives the following list based on official statements:

Company. Material	Gross Amt.
Aetna Exp.—Explosives	\$30,000,000
Amer. Can—Shells	41,000,000
Amer. Car & Fdry.—Shells	7,000,000
Amer. Loco.—Shells	50,000,000
Amer. Steel Fds.—Forgings	18,000,000
Amer. Wood—Cloth	30,000,000
Baldwin Loco.—Shells	146,000,000
Bethlehem—Miscellaneous	300,000,000
Can. Car & F.—Shrapnel	146,000,000
Crucible—Miscellaneous	17,000,000
Curtis Aero—Aeroplanes	15,000,000
DuPont—Explosives	200,000,000
Driggs-Sea.—Miscellaneous	40,000,000
Elec. Boat—Boats, etc.	100,000,000
Gen. Elec.—Materials	69,000,000
Hercules Powder—Cordite	25,000,000
Lackawanna Steel—Steel	10,000,000
N.Y.Air Brake—Shrapnel	20,000,000
Pressed S. Car.—Cars, etc.	15,000,000
Studebaker—Harness, etc.	20,000,000
Westing A.B.—Shrapnel, etc.	18,000,000
Westing, Elect.—Rifles, etc.	94,000,000
Total	\$1,408,000,000

In the case of several of the abovementioned, it is believed that the accredited amount falls many millions short of the actual total. Such is the case with the Crucible Steel Co. While the company's last annual report gave \$17,000,000 as the amount of war orders, it is claimed by interests in inside touch with affairs that the aggregate now is about \$90,000,000.

That the list is far from complete can be seen from the fact that the Remington Arms Co. and the Winchester Arms Co., each generally credited with contracts for at least \$100,000,000 gross, are not included.

The Consolidated Mining and Smelting Co. will make considerable extensions to their zinc refinery at Trail, B.C.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

APPLICATION OF SPRING PINS TO JIGS AND FIXTURES—III.

Among difficulties met with when designing spring pins is the lack of room which will often necessitate the extension in height of a jig. This can sometimes be overcome by us-

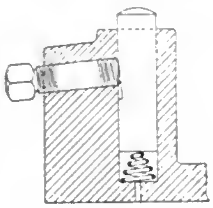


FIG. 11.

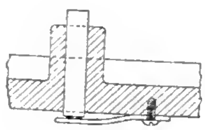


FIG. 11a.

ing a conical spring as shown in Fig. 11, or occasionally a flat spring as shown by Fig. 11a, although the latter will not permit much movement for the pin. In the first the diameter of the pin will largely govern the movement that can be obtained.

Indexing Pins.

While the foregoing illustrations have dealt exclusively with spring pins which are constructed in a manner that causes the spring to force the pin out in order to resist pressure, various pin arrangements are in use where the pins are forced out by screws or other means and a spring is used to force the pin back, or it often happens that the conditions require that the pin be simply held in a slot or hole for an indexing plate as Fig. 12. This arrangement consists of a plate (A) with suitable notches of a number sufficient for the work in hand. A spring plunger (B) is pushed into the notches in the plate by the spring (C) while a fetter screw (D) keeps the pin in its proper relation to the slots in the plate

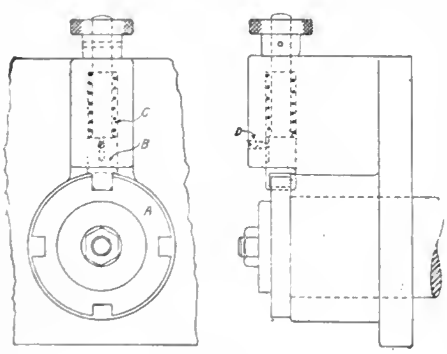


FIG. 12.

and the knurled knob on the end of the spring plunger. This is used to pull the plunger out of the slots when the plate is indexed from one slot to the next as in the drilling of holes or other work that this method might be adapted to.

Compound Arrangement.

Fig. 13 shows another method of arranging spring pins or plungers in which two springs are used, the small pin (A) being made to fit into the holes of an index plate (B) attached to other mechanism for doing the necessary work and is held back against the plunger (C) by a light spring (D) and is forced out into the index plate by the spring (E) on the plunger (C) which is much stronger than the spring (D). Thus when the operator pulls on the knob (F) the plunger C is carried out by the knob and the beveled flat X is kept in the correct relation to the pin (A) by the small guide pin (G), in a notch in the knob. Upon the release of the knob the plunge (C) forces the pin (A) out in the manner previously described which is obvious from the sketch. The purpose of the cap

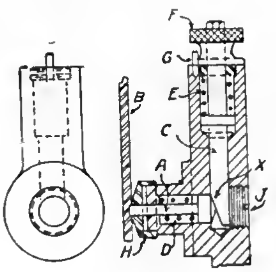


FIG. 13.

(H) is to prevent dirt from entering the holes and the screw (J) plugs the holes after the arrangement is assembled.

Tubing Used as Spring Pins.

In Fig. 14 an illustration of the use of tubing as a spring pin is shown, the arrangement being a simple one. A piece of tubing (A) is split as shown at (X,) and is caused to expand and become locked in its hole by the screw (B) which has a tapered point. The pin is forced up in the usual manner by a spring (E), with a shoe (C) between it and the tubing, while a pin (D) in a slot prevents the pin from jumping out of the hole.

Forcing Pins Into Position.

In Fig. 14a the cut shows a pin (A) being forced up by a pointed screw (B) while it is forced down upon the release of the screw by the spring (C) against the shoulder of the pin and the short screw (D). An arrangement on a similar principle is used to operate the three pins in the pin arbor Fig. 15. This pin arbor is similar to that used for turning pistons and fits on the spindle nose of the lathe in the same manner as a chuck. The body or main part of the arbor (A) is made of cast iron while a steel ring (B) is forced in place on this body and is used for supporting one end of the work

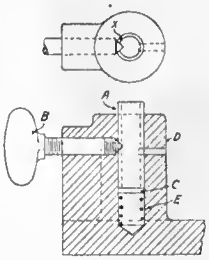


FIG. 14.

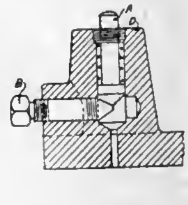


FIG. 14a.

which has previously been bored out to size for a short distance. Now as the other end of the hole is rough, three pins (C) are caused to expand in it to centralize that end. While the principle involved in the operation of these pins is the same as that in Fig. (14a) the construction differs considerably. The three pins are flattened at the sides (X) to fit

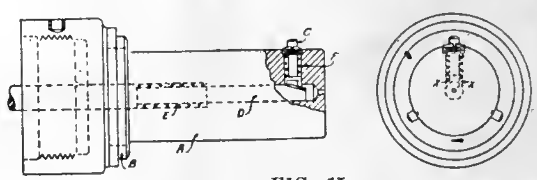


FIG. 15.

into three suitable grooves (beveled to match the pins) in the rod (D), this rod being operated from the back end of the spindle by a suitable hand wheel and bar that pushes it forward and causes the pins to move outward as can be readily seen from the sketch. Upon release of the hand wheel and bar, the spring (E) pushes the rod (D) back, and the springs (F) hold the pins in place against the flats in the rod.

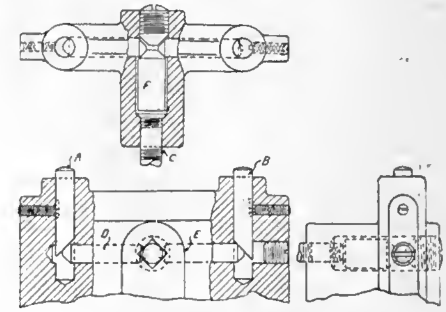


FIG. 16.

Equalizing Arrangement.

The last illustration of this article (Fig. 16) shows an arrangement of pins used as an equalizer which although they

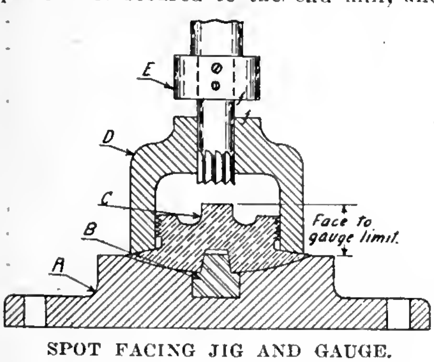
cannot be classed as of the spring variety are nevertheless interesting. The principle of this construction lies in the fact that the two pins A and B must be caused to expand against a rough surface by one square head screw (C) and to do this two pins D and E must be provided. These, by being forced out by the pin F., also in turn force out the pins A and B. The pin F, made considerably smaller than the hole as shown, to permit of it to have sufficient side play in case one of the pins A or B should come up against the work before the other. This permits the pins to equalize or in other words adapt themselves to the rough surface of the work which is very often a necessary condition when supporting work in jigs or fixtures.

As can be seen from the foregoing the application and use of spring pins is vital to the tool and machine design. The simplest and most effective arrangement, yet one which is quick to operate and will not easily get out of order is required, as the pins are usually subjected to very hard usage. This is especially true in jig and fixture applications when the machine operator must be depended on to use his own judgment in the method of handling tools.

SPOT FACING JIG AND GAUGE

By J. Davis.

AN interesting jig for use in facing shrapnel shell plugs consists of a cast iron bar A, which is bolted to the drill press table. On the top of this base a cup-shaped recess is machined, which conforms to the shape of the plug, and in the centre of which is secured a square driving-pin B, which engages with the square hole in the plug. A hardened steel bushing D is made to slip over the threaded portion of the shell plug, and is also bored to fit the end mill, as shown. The bottom face of the bushing is chamfered to correspond with the finished bevelled seat of the plug. A locating piece E is secured to the end mill, and



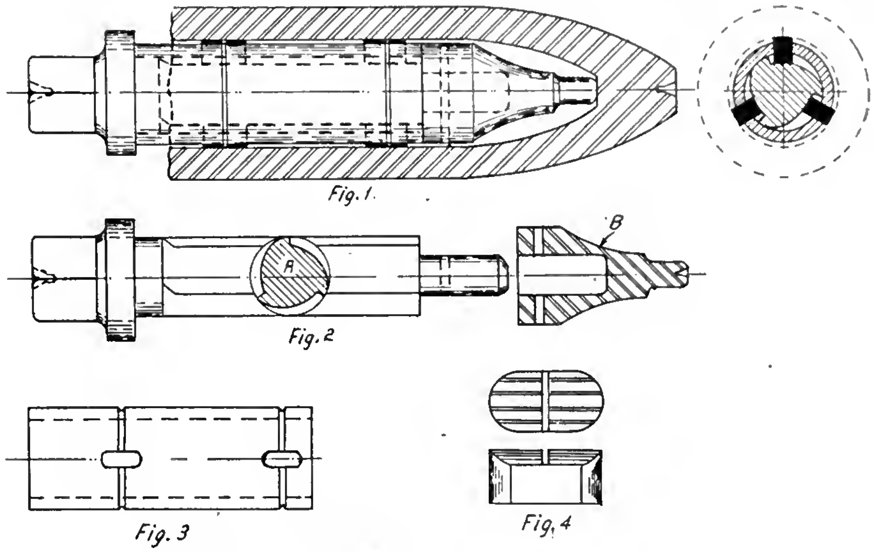
SPOT FACING JIG AND GAUGE.

is so adjusted that when the two finished surfaces of D and E touch, the plug will be faced to the right dimensions. It can be readily seen that with this jig it is impossible to face too much off the plug; and, further, since the location is taken from the machined services, any irregularities in the casting have no effect on the accuracy of the results.

EXPANDING MANDREL FOR HEAVY SHELLS

By G. Barrett.

THE accompanying drawings show a type of expanding mandrel which is somewhat different in constructional features from the usual design. The arbor, Fig. 2, is made from machine steel, the driving end being squared to fit a driver secured to the lathe face-plate. The body of the arbor is milled with a concave cutter, as shown by the cross-section A, and the end is turned down to fit the locating end piece B, the latter being held in place by a taper pin.



DETAILS OF AUTOMATIC EXPANDING ARBOR.

The sleeve, Fig. 3, is bored to slip over the arbor, and has six holes—three at each end, and placed 120° apart, milled to take the grooved driving dogs, Fig. 4. These are held in place by a coil of spring wire, which fits into the recess cut on the outside diameter of the bushing and on the outer surface of the dogs.

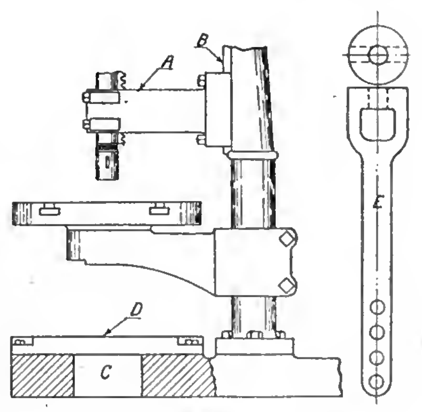
Fig. 1 shows the mandrel in position, as used between the lathe centres, and this gives a clear conception of the operation. The fact that it is driven from the square end causes the eccentric lift on the centre arbor to force the dogs out. This action causes a secure grip, and it can be readily seen that the harder the pressure on the cutting tool the tighter the dogs will grip the forging.

DRILL PRESS SUGGESTION

By J. H. R.

SOME time ago we were faced with a problem that required considerable contriving on the drill press before we could finally arrive at the result desired. It was necessary to drill the hole in the end of the piece E, and the overall length was such that it was necessary to use the shortest drill possible and remove the eye bolt (that connected with the balance weight), also a gear guard, to allow the arm A to be raised to the extreme limit of the slide B.

In almost every make of solid frame drill press the bed of the frame is left solid, with a number of tee slots. To remedy this, and facilitate the operation on work similar to the piece here shown, it might be a profitable move on the part of drill press manufacturers to have the centre of the base plate cored as at C, and, if necessary or desirable, have an auxiliary bolster plate to cover the cored hole.



A DRILL PRESS SUGGESTION.

Galt, Ont.—The Grand River overflowed last Friday and did considerable damage to the plants located along its banks. The factories of C. Turnbull Co., Galt Knitting Co. and the foundries of Cowan Co., Perfect Machinery Co and Canada Machinery Corporation were partially flooded, the damage in each case being $400 to $1,000.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

IMPORTANCE OF SMALL TOOLS TO ENGINEERING

from "Herbert's Monthly"

THE strength of a chain is that of its weakest link; hang a weight on the chain and unless every link is able to support the load, it will break. Each link must also bear, in addition to the load, the weight of the links below it.

A number of factors, which may be likened to the links of a chain, enter into the administration of every engineering business. Management, organization, supervision, workmen and plant must each be capable of bearing a due share of the load, or the business will suffer; the weak link will impair the efficiency of the whole system. The strongest links must necessarily be at the top, where the strain is greatest.

The plant will consist mainly of machine tools and their equipment, the latter comprising chucks, vices, drills, reamers, milling cutters, and a number of other accessories, all of which come under the heading of small tools. These small tools in themselves constitute a link in our chain, a link which must be strong enough for the work it has to perform. No matter how good the machines included in the plant may be, unless they are equipped with a sufficient quantity of good, small tools, they cannot be run to the best advantage.

The Small Tool Dealer

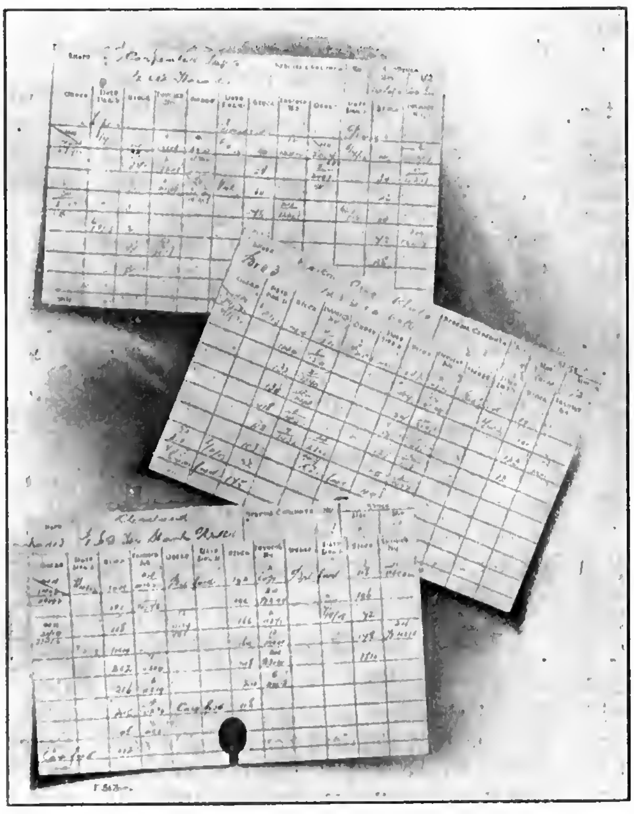
Those engaged in supplying small tools may fairly claim to serve a useful purpose by enabling their customers to obtain the articles which are needed for the proper equipment of their plant. A small tool business can only be successfully developed so long as it offers efficient service to the buyer. Efficient service means prompt delivery of goods of the right quality at competitive price; it requires enterprise, technical knowledge and commercial ability.

The small tool dealer must be enterprising in his search for new and improved appliances, which will be of service to his customers. Technical knowledge is required for the selection and testing of those which appear to possess desirable features. Commercial ability is necessary when dealing with the multitudinous problems which daily arise in the purchase, shipping, storage, and delivery of the vast numbers of articles that are included in a stock of small tools.

To turn now from the abstract to the concrete, what follows describes briefly the system followed in the small tool department of Alfred Herbert Ltd., Coventry, England, and the hope is expressed by the management of that concern that it may be of some interest, and may possibly give rise to criticism and suggestions which will result in better service.

The Small Tool Department

This branch of the business has passed through many vicissitudes during the eight years it has been in existence. Its rapid growth has necessitated considerable additions to the personnel and to the warehouse accommodation. This has naturally involved occasional revisions of the systems in use, and has made considerable demands on those responsible for running the department. The most important duty is to deliver promptly the goods ordered. This means that the goods must be in stock when ordered, and that there must be in existence the proper machinery for attending to the despatch of the orders.



CARDS USED IN KEEPING A SMALL TOOL STOCK RECORD

Maintenance of Stock

At the head works in Coventry, the storage of small tools occupies a floor space of approximately three and a half thousand square feet. The multitude of orders dealt with every week keeps the stock continually on the move, and it is no easy matter to ensure it being at all times equal to the demand.

It is undertaken to furnish anything and everything in the accessory line for the machine, fitting and erecting shops, from a split pin to a portable crane. The question of what to stock and in what quantities is all important.

The first essential is quality; this is put before every other consideration, when deciding on what to offer. Prices, of course, must be reasonable, and it is also important that makers should be able to make prompt deliveries. This last point is a sore one with all concerned in this class of business, and the writer can say from experience that it has caused him more worry than almost anything else.

The maintenance of a stock requisite for the amount of business to be done necessitates a systematic record of the coming and goings of hundreds and thousands of small articles. The recording system used by the storekeeper provides theoretically for every contingency. It is a card system, three sample cards being shown in the accompanying illustration. A separate card is made out for each different size of every kind of article. In one column is entered the number of articles ordered from the maker, Alfred Herbert, Ltd., order number and the date. In the next column the date when the goods are received. The third column indicates the number of articles in stock after each transaction, while the fourth column gives the number of articles ordered by the customer and the invoice number.

For purposes of stock keeping the third column is most important. It shows the state of the stock at any moment, and as soon as the figure reaches a predetermined minimum a new order is sent to the makers to bring the stock up to its normal level again. The advan-

tages of this system will be obvious, as the information it gives is invaluable to the storekeeper. It also shows when the stock is not selling, a point not to be overlooked.

The maximum and minimum quantities to be stocked are shown on the card; these, however, must only be taken as a general guide, the experience and discretion of the storekeeper deciding each case on its merits when the time comes to re-order for stock. When the predetermined minimum is reached the man in charge of the card index record notes the fact by fixing a small metal clip or "tickler" to the card. At the end of the day the "tickled" cards are gone through, and the requisitions for replacements sent to the head of the department.

Theoretically, of course, nothing could go wrong with such a system, but you can organize and systemize as you like, "the best laid schemes o' mice and men gang aft agley." There may have been an unusual run on a certain article, so that your stock is diminished faster than it can be replenished; manufacturers may be late in despatching; there may be delays in transit; all causes entirely beyond the control of the not-to-be-envied storekeeper. Although every care is taken, there must be times, alas, when you have to shamefacedly admit to your customer that you cannot supply him from stock with a ½ in. drill, or some such every-day tool.

Customers' Orders.

The method adopted for dealing with customers' orders are based on the assumption that when an order is received for small tools those tools are wanted and wanted quickly. This is clearly understood, and worked upon by the whole of the staff.

Each morning the orders are sorted out from the day's correspondence and sent to the warehouse. The storekeeper then goes through them, sorting out those for goods which he happens to know are in stock. These are then dealt with promptly, while the stock record cards are consulted for the remainder. A second sorting then takes place, as the cards shew which of the required goods are in stock and which are not.

The orders for goods in stock are handed over to the storekeeper's men, who get the articles from their bins or shelves and deliver them to the packers, at the same time checking them by the customer's original order. The order is then given to the invoicing clerks, who type out simultaneously the invoice, advice note, packer's note and copies for the accounts department, thereby obviating the risk of mistakes. As the goods are packed they are checked by the packer's note, which is then initialled by the responsible person and sent to the stock record keeper to be noted on his cards. Thus the goods are twice checked before being despatched. When goods are not in stock, it is first ascertained if they are on order. If so, references are made on our copy of the order to the manufacturer. When such goods are received, the customer's original order is then treated exactly as before mentioned.

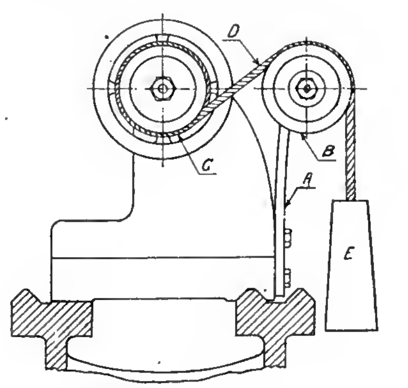
From the above it will be noted that the customers' original orders are used throughout, thus eliminating errors in making copies and saving valuable time. Mistakes do occur sometimes, as the human species is prone to error, but every endeavour is made to avoid them. It will be seen that the object particularly timed at in organizing the work of the staff is quick delivery, all other considerations being secondary to that end.

The foregoing notes on the work and place of the small tool dealer may perhaps help others to realize that he has problems peculiarly his own to solve. The success of his business depends entirely on the good-will of his customers, and this can only be secured and retained by unremitting, reliable and efficient service.

POWER DRILLING DEVICE

By J. G.

THE process of drilling holes in the ends of pieces held in the chuck on a lathe by means of the tailstock is often a tiresome operation. The method here shown of using a weight E, supported from a rope D, which passes over the pulley B and on to the pulley C, relieves the lathe hand of considerable labor. The pulley B is carried on a pin secured to the bracket A, which is fastened to the tailstock as shown.



POWER FEED TO LATHE TAIL STOCK FOR DRILLING.

Calgary, Alta.—By means of economies effected, and reduction in the cost of power, Calgary's street lighting, which is among the best on the continent, cost $10,000 less in 1915 than in 1914.

SUDBURY CONSTRUCTION AND MACHINERY CO.

THE expansion of the diversified industries of New Ontario is reflected in the additions and alterations which the Sudbury Construction & Machinery Co., are having made on their plant in Sudbury, and which are to be rushed to early completion. These include extensions to the present foundry building, the erection of a new cupola house, a new and much larger cupola and a cleaning shed, giving some 2,600 square feet additional manufacturing space, all of which when completed will give a total of 27,336 square feet of manufacturing area.

The new cupola house, 30 x 40 ft., to be built, and the installation of a new and much larger cupola, will give the company a fifty per cent. increase, from 100 to 150 tons, of castings a month. An addition, 30 x 40 ft., to the present foundry will be devoted entirely to the casting of brass, and the removal of the cupola to a new and separate structure will give greatly increased facilities for casting. A cleaning house where all castings will be finally finished and prepared for shipment will leave the foundries free and clear of impediments in the handling of their work. A new 7½ ton crane is to be installed to handle the heavier loads expeditiously.

The new buildings are to be erected in close proximity to the present structures and when complete will make the industry one of the most imposing in Sudbury.

At present, and for some time past, the Sudbury Construction & Machinery Co., have been working to full capacity, with a force of some seventy mechanics and a monthly pay-roll of $4,500. A large portion of the company's business comes from the northern mining district of Cobalt, Timmins, Porcupine and adjacent area, with the nickel and lumbering industries also contributing heavily. A close study of the needs of these industries of the north has put them in an enviable position to handle not only the manufacture, but the repair work of mining, smelting and lumbering machinery. This is also true of railway contractor's plant, repairs and alterations to which for years passed to Eastern points. The company is at the present time working on an order for equipment for two munition factories in the East, engaged in the manufacture of high explosives.

From a small but healthy beginning in 1909, the Sudbury Construction & Machinery Co., has rapidly reached proportions which to-day make it Sudbury's foremost industry, and this development has not only been rapid but permanent All buildings are substantial, of brick and steel, and equipped with the most modern machinery.

NEW PROCESS DEVELOPMENTS

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

ALLOY STEELS—II.*

By G. L. Norris

THE use of alloy steels in cutting tools dates back nearly 100 years, although it was not until after 1850 or 1860 that alloy steel for this purpose became firmly established. With the advent of iron-clad warships began the struggle for supremacy between projectile and armor plate that has been so fruitful in the development of alloy steels. Chromium, nickel and nickel-chromium steels are largely the result of this struggle.

The publication in 1888 by Hadfield of the results of an extensive research of the alloys of manganese and steel, which resulted in the discovery of a remarkable new alloy steel marked a period of active investigation into the effect of other metals on steel. The most important of these were the investigations on nickel steels by James Riley in 1889, which demonstrated that a mild open-hearth steel, such as used for structural, general forging and machinery purposes, when alloyed with 3 to 4 per cent. nickel had considerably higher elastic limit and tensile strength, with practically the same or greater ductility. One of the earliest and most extensive applications of nickel steel was for armor plate. For many years nickel steel was the principal alloy steel in use.

During this same period, Hadfield made investigation of the effects of silicon on steel, and also a very complete study of chromium steels, which for some time had been used in a small way for springs and special forgings, but principally for tools and armor piercing projectiles. The development of high-speed steel about 1900, made it possible to readily machine heat-treated alloy steels, and the advent of the automobile with its demand for superior steel, have brought about the present extensive use and development of alloy steels.

Effect of Automobile Industry

The automobile industry, with its demand for steel of high strength and durability, has been undoubtedly the most important factor in the development of commercial alloy steels, and the largest consumer. Alloy steels are used extensively for transmission gears and shafting, axles, steering levers and spindles, springs, chassis frames, crank shaft, cam shaft, connecting rods, valves and many other parts of automobiles.

They are also extensively employed in forgings for high-speed engines, marine engines, locomotives, electrical machinery, mining machinery and other mechanical engineering structures. The use of alloy steels in bridge construction has been limited, but there is undoubtedly a field in long-span bridges for an alloy steel of high strength that can be used in the condition as rolled, preferably, or at most with a simple annealing.

Coincident and having a marked influence on the development of alloy steels, was the discovery of large deposits of vanadium ore in Peru, thus assuring a source of supply at a reasonable cost of this rare metal, which is the most powerful yet discovered for alloying with steel, that is, in small amounts.

The most important of the engineering or constructural alloy steels are those containing nickel, chromium and vanadium, singly or in combination. With all these steels it is possible, through heat-treatment, to obtain a tremendous range in strength, in round numbers varying from 100,000 to 250,000 pounds per square inch, depending also, of course, upon the size of the section.

Manganese Steel

This steel usually contains 10 to 13 per cent. of manganese and approximately 1 per cent. of carbon. It is practically non-magnetic and has a peculiar hardness to which it owes a remarkable resistance to abrasion. It is extremely difficult to machine. It has high strength and toughness, but relatively low elastic limit. With care it can be forged and rolled. It has found its principal application in castings for crushing and grinding machinery and railroad crossings. Manganese steel has the peculiar property of being toughened and softened by quenching in water, resembling copper in this respect. All manganese steel castings are subjected to this treatment to remove brittleness.

Silicon Steel

There are two types of silicon steel, one of which has found some application as an engineering steel. This steel, frequently called silico-manganese steel, is generally covered by the following limits of composition: Carbon, 0.45 to 0.65 per cent.; silicon, 1.50 to 2.00 per cent.; manganese, 0.50 to 0.80 per cent.; the manganese is normal, contrary to what is indicated by the name The principal application of this steel is for automobile springs, and to some extent for gears. It fibres readily through heat-treatment, and is very brittle in the direction at right angles to rolling. It is very sensitive to heat-treatment, and a relatively small variation in annealing temperature after quenching has a strong effect on the results obtained. The other type of silicon steel contains 3 to 5 per cent. silicon, is low in carbon and manganese and is extensively used for electrical transformer sheets on account of its high permeability and electrical resistance. It is weak and has no constructural value.

Nickel Steel

Nickel alloys with steel in all proportions, but by far the most important nickel steel, from an engineering standpoint, is the low and medium-carbon steel with 3 to 4 per cent. of nickel, commonly known as 3½ per cent. nickel steel. The presence of manganese in nickel steel is very essential, as it has a marked effect on the mechanical properties. The amount of manganese should range from 0.50 to 0.80 per cent. This steel has been extensively used since its introduction in 1889, and is a good all-round engineering and structural steel with considerably higher elastic limit and tensile strength than the corresponding carbon steel, and with practically the same degree of ductility. The low-carbon steel, 0.10 to 0.20 per cent. carbon, is used extensively for case-hardening parts. It case-hardens more readily than carbon steel and gives a harder casing with a strong, tough, fibrous core.

A great deal of nickel steel with carbon from 0.20 to 0.35 per cent. has been used in shapes and plates as rolled, and in annealed eye-bars for bridge construction. In this condition, which is not to be recommended for forgings, the following are typical physical properties: Elastic limit, 45,000 to 60,000 lbs. per sq. in.; tensile strength, 80,000 to 100,000 lbs. per sq. in.; elongation in 2 inches, 20 to 15 per cent.; reduction of area, 40 to 25 per cent. Annealed nickel steel forgings have only slight advantage in strength over carbon steel, and consequently are not advantageous either from an engineering standpoint or commercially unless heat-treated. With heat-treatment it gives considerably higher strength than carbon steel, combined with greater ductility or toughness. It does not give as high values as

*From a paper presented at the International Engineering Congress, San Francisco, Cal.

the nickel-chromium and chromium-vanadium steels.

Nickel steel rolls and forges readily and machines easily. It develops a very thick, hard scale which is apt to give considerable trouble in drop-forging and is hard on the dies. Nickel steel is also very liable to develop seaminess, especially when made in large heats and cast into large ingots, as is now customary. It requires a larger discard to ensure soundness. The use of nickel steel in forgings, and particularly drop-forgings, is falling off in favor of other alloy steels with greater values.

Chromium Steel

The use of this steel is confined principally to a few specialties and it is not in general use as an all-round engineering steel. One of the principal uses is for balls and ball races. The great mineralogical hardness obtained by quenching is very desirable for this purpose. The steel for this application contains approximately 1 per cent. each of carbon and chromium.

Chromium steel is also used for stamp-mill shoes, and in combination with soft steel in laminated plates for construction of burglar-proof safes, and in the same combination for bars in jails. The low and medium-carbon types containing 0.80 per cent. or less of chromium, have somewhat higher mechanical properties than the corresponding carbon steel. It is not used to any great extent, other alloy steels being superior, both in static and dynamic strength. Chromium steel is also very liable to crack and check in heat-treatment.

Nickel-Chromium Steel

The addition of chromium to nickel steel has a marked effect, greatly increasing the strength and resistance to shock and particularly the mineralogical hardness. It is more difficult to forge and heat-treat, and harder to machine, and is also liable to the seaminess frequently present in nickel steel. There are three types of this steel, differing both in the percentage of nickel and chromium, and all with low or medium carbon:

	Nickel	Chromium	Carbon
1	3.5%	1.50%	0.25 to 0.45%
2	2.0%	1.00%	0.10 to 0.45%
3	1.5%	0.50%	0.10 to 0.45%

The first type is used principally for armor plate and armor-piercing projectiles and came into use about 1895, superseding the nickel plates and chromium projectiles. The other two types were developed by the automobile industry. The second type is largely for automobile forgings. It gives high strength with heat treatment, has great hardness and good shock and fatigue resisting qualities. The third type is a largely used all-round engineering steel. It is used for automobile forgings and for a variety of miscellaneous drop-forgings and machine parts. It is an excellent case-hardened steel, carbonizing readily. This type is more tractable in working, heat-treating and machining than the other two. It is also somewhat lower in tensile strength.

Vanadium Steel

The addition of small amounts of vanadium, generally under 0.25 per cent., to simple carbon steel or any of the alloy steels increases very considerably—about 30 per cent. or more—the elastic limit and breaking strength, without materially affecting the ductility. To an even greater extent it increases the resistance to shock and fatigue. The vanadium steel which has been up to now most generally used is a chromium-vanadium steel of the following typical composition: Carbon, 0.10 to 0.55 per cent.; manganese, 0.50 to 0.80 per cent.; chromium, 0.80 to 1.00 per cent.; vanadium, over 0.15 per cent.

The lower carbon type, 0.10 to 0.20 per cent., is used mainly for case-hardening and is the best steel for this purpose. It carbonizes readily, gives the highest maximum carbon and finest grain. The casing is very strongly coherent to the core, very hard, tough and strong and practically free from any tendency to flake or powder. The core is remarkably strong and tough.

The higher limits of carbon 0.45 to 0.55 per cent., are extensively used for automobile and locomotive springs, giving remarkable resiliency and endurance. It is also extensively used for oil-tempered gears. The range in carbon from 0.35 to 0.45 per cent. is largely employed for crank shafts, locomotive axles, crank pins connecting rods, hammer piston rods, automobile transmissions and rear axle shafts. The range from 0.25 to 0.35 per cent. carbon is used for automobile forgings of all kinds and a great variety of miscellaneous work requiring the best combination of static and dynamic strength. As illustrating the wonderful shock and fatigue enduring qualities of chrome-vanadium steel, drop hammer piston rods of this material are giving many times the length of service of carbon, nickel and chromium-nickel steel rods.

Vanadium steels have a much wider heat-treatment range than other steels. The desired physical properties can be obtained with a higher draw-back or annealing temperature, which is very advantageous as more completely removing quenching strains, and also as a manufacturing proposition. Chromium-vanadium steel forges and machines better than nickel-chromium steel, is not as liable to injury in heating for forging, is not so liable to crack or check in heat-treatment and is free from the seamy tendency of steel containing nickel.

Carbon steel with a small percentage of vanadium, from 0.15 to 0.20 per cent., has been used extensively for locomotive frame castings with great success. The failures of these frames from all causes over a period of nearly ten years has been only a fraction of one per cent. In tool steel grades, this steel has better cutting qualities, hardens deeper and more uniformly, and has remarkable toughness. In what are termed battering tools, chisels, cutters, dies, etc., it gives several times the length of service of ordinary carbon tool steel.

Vanadium Cost

The handicap of high cost of vanadium has almost disappeared, and simple carbon-vanadium steel in the ordinary forging grades will undoubtedly soon become very widely used as an all-round engineering steel, when a better steel than carbon is required. It is remarkably clean and is as easily worked as carbon steel. It is free from the seaminess and ugly scale of nickel steels and the tendency to check and crack of the chromium steels, particularly nickel-chromium.

Tests of carbon-vanadium steel rails in curves are showing about 20 per cent. less wear than rails with 0.15 to 0.20 per cent. higher carbon, and are also considerably stronger. This difference in wear will doubtless be much greater when the carbon percentage in the vanadium rails is increased to that of the standard rails. In simple annealed forgings, plain vanadium steel has physical properties well above those specified for heat-treated (quenched and tempered) carbon steel.

This type of vanadium steel has a wider range of quenching temperature than nickel or nickel-chromium steels; and for mechanical properties after heat treatment is practically on an equality with $3\frac{1}{2}$ per cent. nickel or the low nickel-chromium steels in general use, and apparently has higher fatigue resisting qualities. While nickel and chromium interfere seriously with the welding quality of steel, vanadium does not, but on the contrary improves this quality. Vanadium steel wire is in common use for autogenous welding.

Tungsten Steel

This is principally used for magnets for magnetos and to some extent in hack saws and special tool steels. Tungsten is seldom used in engineering constructional steels, and then usually in combination with chromium.

Complex Alloy Steel

Practically none of the constructional steels contain three or more alloy metals. The only steel in this class to be considered is what is commonly known as

high-speed steel. Robert Mushet developed and patented about 1860 an air-hardening steel that was very much superior to carbon tool steel for machining hard material. Mushet steel, as it was known, had about the following composition: Carbon, 2.00 per cent.; manganese, 1.75 per cent.; silicon, 0.75 per cent.; chromium, 0.40 per cent.; tungsten, 5.50 per cent.

At the Paris Exposition in 1900, the Bethlehem Steel Co., exhibited a new tool steel that took wonderfully heavy cuts at high speeds, the point of the tool heating up to a strong blue color without losing its edge. This steel, which immediately became known as high-speed steel, was the culmination of the research work carried on for many years by Mr. F. W. Taylor and later published in his monograph "The Art of Cutting Metals." The difference between this steel and Mushet steel is apparent from the following typical composition; Carbon, 0.60 per cent.; manganese, 0.20 per cent.; silicon, 0.10 per cent.; chromium, 4.00 per cent.; tungsten, 18.00 per cent. With this steel, cutting speeds of over 90 feet per minute were obtained.

Within three or four years it was found that the addition of vanadium to high-speed steel made is possible to still greatly increase the speed and size of cut. At first only about 0.30 per cent. vanadium was added, but this has been increased until now 1.00 per cent. is practically the standard amount in most high-speed steels, and speeds of 140 feet and upward per minute have been attained.

Lately the addition of cobalt to high-speed steel has been meeting with favor as still further improving the endurance of the steel. The amount of cobalt generally used is 3 to 4 per cent., with no change in the percentage of the other metals—tungsten, chromium and vanadium.

CONCERNING ELECTRICAL MACHINERY

THE voltage which a dynamo produces depends upon three things:—The strength of the field in which the armature rotates; the construction of the armature; the speed at which the armature rotates. The current depends upon two things:—The voltage produced, and the total resistance of the circuit.

The strength of the current which can be taken from any dynamo is limited by the heating effect of the armature wires. The temperature of the armature should not exceed 70 deg. F. over that of surrounding air. The armature has two parallel circuits through each of which half the total current would flow.

The output of a dynamo is determined by the product—volts × amperes. We may, for instance, wind an armature to get 20 amperes at 250 volts, or 10 amperes at 500 volts. The output remains the same in both cases, provided the other factors are kept constant. Generally, to increase the output of a machine, we must increase the speed. This is limited by the temperature rise and the mechanical strength of the armature. Before increasing the speed it is necessary to make certain that the conductors are so wound or secured as to prevent loosening by centrifugal force. If a machine be run at 1,000 instead of 2,000 revolutions per minute we get half the voltage, and hence only half the output.

Regulation of Dynamo Output

By means of a resistance and regulating switch the current in the field coils of a shunt dynamo can be varied, and the pressure at the dynamo terminals regulated. Shunt machines can be designed to give a practically flat "characteristic" at constant speed.

If we run a dynamo at constant speed, and measure the current in the external circuit and the voltage at the dynamo terminals, then increase the load, adjust the speed to its former value and take fresh readings, we get a series of readings which show the relation between the varying quantities of "current" and "pressure."

By plotting the volts as ordinates, and the amperes as abscissae, we get what is called the "characteristic" curve for our machine. Much information can be obtained from the "characteristic" curve of a dynamo since from it the behavior of the machine under varying conditions of load can be studied.

Commercial Efficiency Feature

One important point in connection with dynamo electric machinery is the determination of its commercial efficiency: in the case of a generator, the ratio of the useful electrical activity (external activity) to the total mechanical activity applied in driving the machine; and in the case of a motor, the ratio of the useful mechanical power obtained on the armature shaft, to the electrical power absorbed. The electrical power should be measured at the terminals of the apparatus. Mechanical power should be measured at the pulley or coupling.

The electrical power can be measured with extreme accuracy, but the accurate measurement of the mechanical power in either case presents considerable difficulty. Where the dynamo is directly coupled to a steam set, the power indicated in the engine cylinders, less the portion wasted in the engine itself, gives the brake horse power supplied to the dynamo. The results obtained from this calculation cannot be regarded as very accurate, owing to the uncertainty of obtaining the exact waste in the prime mover. A transmission dynamometer, or a friction brake, is generally used to determine the horse power expended or obtained.

To determine the electrical power take the potential difference at the terminals of the external circuit, and the current flowing through a motor with the potential difference at its terminals; the product of the two quantities in either case gives the power in watts.

The efficiency could also be obtained by adding the sum of all the individual losses to the output to derive the input, or by subtracting their sum from the input to derive the output. The ratio of the useful electrical activity to the total electrical activity is known as the electrical efficiency. It should be noted that a small increase of the armature resistance would lower the figure considerably, because the armature carries such heavy currents. The electrical efficiency would, on the other hand, be increased if more turns of wire were wound on the field magnets, because the added resistance would diminish the current strength.—Herberts Monthly.

A HANDY LEVEL

By R. F. G.

THE sketch here shown illustrates a very serviceable and convenient method of constructing a level, and, while not very substantial, it may, with careful usage, be made to answer a very useful purpose.

A HANDY LEVEL.

A piece of gauge glass (b) of a suitable length is filled with water, and a small cork (a) inserted in each end; by adjustment of the cork any desired size air bubble may be obtained.

France Buying Copper.—A New York despatch of January 28 states that a million pounds of copper, part March and part April delivery, sold in New York two days previously for 26½ cents a pound. The sales of nearby copper at higher figures have not resulted in any change in the quotations of the larger interests, who continue to ask 25½ cents for May and forward months. Domestic inquiry is steady from day to day, and the foreign demand is far from being satisfied. France is buying as far ahead as June and paying 25½ cents.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

HIGH SPEED POWER HACK SAW MACHINE

THE high speed power hack saw machine shown in the accompanying photographs has been designed to embody all possible labor saving features and mechanical improvements while avoiding complicated mechanism or delicate construction. It is designed to operate at a speed of 250 revs. per min., at which speed it will cut low-carbon steel and other soft metals, fibre, hard rubber, etc., at an almost unsurpassed speed. A record of cutting a 3 in. bar in less than 2 min. at the above speed is claimed for this machine by the makers, the Peerless Machine Company, Inc., of Racine, Wis.

Full cabinet bed construction is provided which enables the machine to be used for heavy work without risk of springing the working parts and avoids the annoyance of small supporting feet sinking into floors, etc. The cabinet forms a tank for the cutting compound which is circulated by a pump located inside of the rear end. A trough surrounds the work table, collecting the compound and returning it through suitable straining devices to the bottom of the cabinet.

Tee slots are provided on each side of the vise so that irregularly-shaped metal can be clamped down if required. The vise is quick acting by means of an adjustable block which carries the tightening screw. A special quick-acting attachment prevents the jaws from tilting when cutting short pieces.

The saw frame travels in vee-shaped slides, the bearing of the frame being $11\frac{1}{2}$ in. long. Wear is taken up by adjusting the upper slide.

The feeding mechanism is operated by a spring which gives a uniform pressure on blade throughout the entire cut, the pressure being controlled by the lever shown on left hand side of machine. When raised to the top notch this device exerts a pressure of 125 lbs. on the blade, and dispenses entirely with the use of weights.

Automatic lifting mechanism is provided for raising the saw frame on the return stroke. This is accomplished by means of a spring which raises the saw frame clear of the work. By means of a cam on the main shaft the powerful main feed spring is allowed to act on the cutting stroke only.

A feature of the feeding mechanism is the arrangement whereby the feed does not come into action till the belt has traveled over three-quarters of its distance when starting. Besides allowing the compound to get on to the blade before the feed pressure is applied it allows the operator to apply a gentle pressure on the blade during the first few strokes avoiding the stripping of teeth when starting a cut on sharp edges

When a cut is finished or a blade brakes, the feed increases during the remaining portion of the stroke when the machine is automatically stopped, and the frame raised to any previously adjusted height. A depth gauge which stops the machine at any desired depth is fitted.

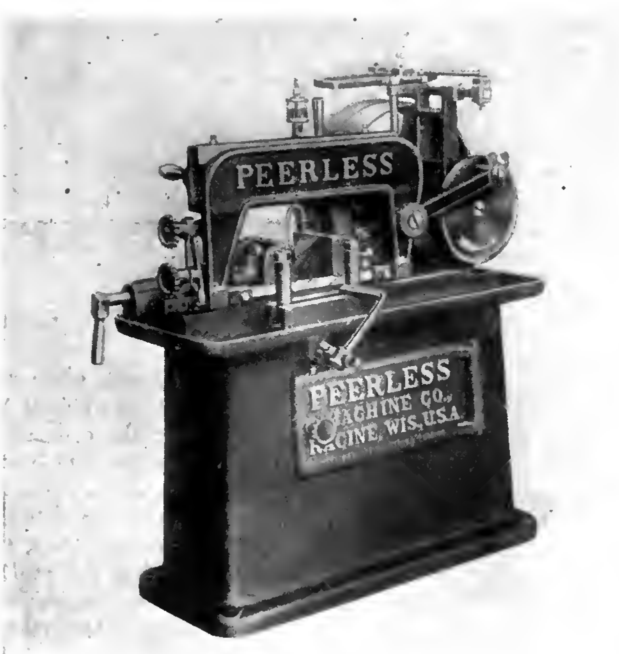
Tight and loose pulleys are 16 in. x 3 in. Crank pin and wrist pin are hardened steel 1 in. dia. x $1\frac{1}{4}$ in. long, a cap for taking up wear being fitted on crank pin end of connecting rod. Ample provision has been made for efficient lubrication of the wearing parts.

SHELL CUTTING OFF MACHINE WITH REVOLVING CUTTERS

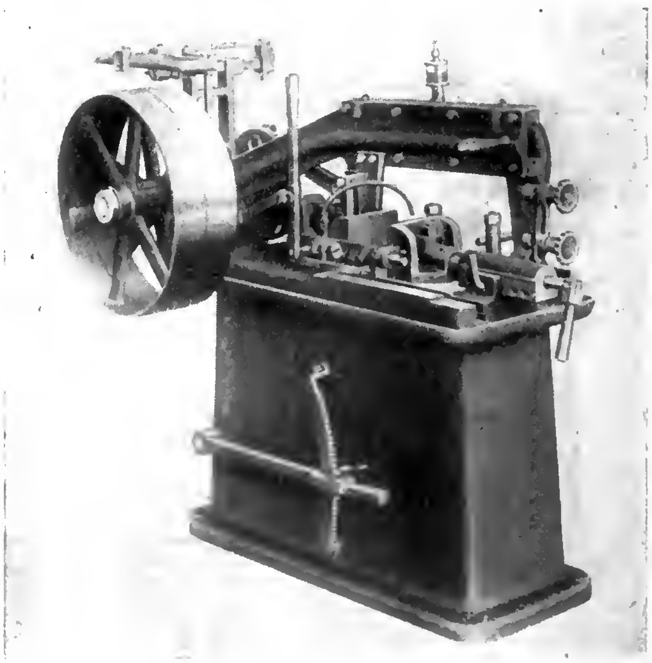
AN interesting type of cutting-off machine for shrapnel shell forgings has been developed by the Curtis & Curtis Co., Bridgeport, Conn., and is being placed on the Canadian market by Watson, Jack & Co., Montreal.

The principle of rotating the cutter head around the shell has been adopted in these machines, enabling four cutting tools to be brought into action by means of an automatic continuous feed mechanism of simple design.

Illustration Fig. 1 shows the working side of the machine, the forging being held in a two-jaw self-centering vise on



RIGHT-HAND SIDE OF HIGH-SPEED HACK SAW.



LEFT-HAND SIDE OF HIGH-SPEED HACK SAW.

the side next the operator. The cutters, which are shown in Fig. 2, are alternately square and pointed for chip breaking purposes, and are driven round by a driving plate encased by the housing. This plate has gear teeth around its rim which engage with a driving pinion at the left of the machine, this pinion in turn being driven from a two-speed cone by suitable reduction gears.

FIG. 1. WORKING SIDE OF CUTTING-OFF MACHINE.

The feed cam, Fig. 3, is of approximately the same diameter as the driving plate, and engages its groove D on the pins H. A separate pinion is mounted beside the driving plate pinion, the ratio of it being such that the cam plate is revolved slightly quicker than the driving plate, this advance in relative position causing the cam groove to feed the cutters into the work. At the termination of this travel the cam groove is arranged to give a quick return to the cutters as will be observed in Fig. 3.

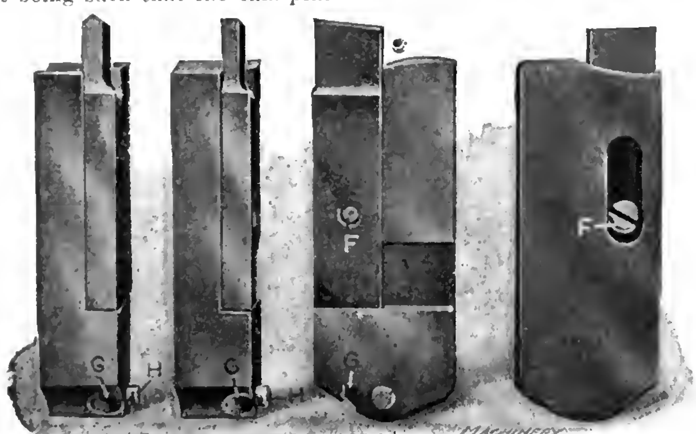


FIG. 2. CUTTER HOLDERS WITH ADJUSTABLE BLADES SHOWING PIN FOR ENGAGING FEED CAM.

The cutter holders carry high-speed blades, which can be adjusted for wear by screw G, after loosening binding screw F; the cutter holders are removed singly through groove E, Fig, 3, without disturbing any parts of the machine. A stop bar is provided, as shown in Fig. 1, for locating the shell in position from the inside of the base.

Regular equipment includes a countershaft, oil pump and one set of tools. Approximate weight is 1,200 pounds and floor space required is 36 by 24 inches. In addition to its application to shrapnel work, the machine is suited for all classes of tubular work.

DOMINION STEEL CORPORATION MANAGEMENT

OWING to continued ill health, and in order that he may take an extended holiday abroad, J. H. Plummer for the past six years president of the Dominion Steel Corporation, and president of the Dominion Iron & Steel Co., for upwards of ten years, retired from active management of the corporation on January 28. Mark Workman, of Montreal, also a director of the company for many years, was unanimously chosen to succeed Mr. Plummer as president. Mr. Plummer remains a director of the corporation and will in future fill a new post, that of chairman of the board. After his return from abroad he will take part in the management of the company's affairs as a director only. Hector McInnes of Halifax was appointed to the directorate.

The retirement of Mr. Plummer had been expected for some time and will not therefore be received with surprise. For many months the president's health has been poor, and this chiefly owing to the strenuous efforts he put forth in readjusting the organization of the corporation to meet the changed conditions brought about by the war. Mr. Plummer was almost solely responsible for the company's new high explosive enterprise and he worked hard for months in bringing it to its present state of efficiency.

FIG. 3. FEED CAM FOR AUTOMATIC CONTINUOUS FEED AND QUICK RETURN.

Mr. Workman announced after the meeting that he would devote almost his entire time to managing the company's affairs, and that his headquarters would be in Montreal.

There had been no improvement in the domestic demand for steel products, the new president asserted, but the continued slowness of trade in Canada was not causing any anxiety. At present, and for some time to come, export business was expected to occupy fully all branches of the company's plants. Mr. Workman said that the toluol plant was fulfilling all expectations and that active operations on shell work continued.

Mr. Plummer has booked passage and was expected to leave New York for England on February 1, as a passenger on the Rotterdam.

The MacLean Publishing Company
LIMITED

(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor.

Associate Editors.

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

B. G. NEWTON - - - - - Advertising Manager

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. FEBRUARY 3, 1916 No. 5

FAIR PLAY FOR THE IMPERIAL MUNITIONS BOARD

IN our issue of January 20, in an editorial entitled "Planning for a Shell-less To-morrow," we stated that in our opinion 'the time had come when the concentration on munitions manufacture in Canada might well be less exclusive, and that as opportunity arises to direct our now highly developed energies into other and war-created channels, no hesitation should be displayed in parting with the old and getting on with the new.' It is quite evident that our views do not in any sense commend themselves to certain interests as was to be expected, and while of course the latter are the victims of circumstance and in consequence merit sympathy rather than anything else, there is always the possibility that the extravagance of statement and absurdity of propositions put forward by them may have an unsettling effect on some at least of our metal-working plant executive aims and ideals. Let us say here that since our last writing we have had no cause even to modify, much less change our opinion, developments of the past few days giving, as a matter of fact, added strength to our convictions.

Criticism of Munitions Board

As far as Canada's metal-working plants are concerned, we are possibly in more direct touch than is any other interest—individual or collective, and while cold facts are not always palatable, once in a while they must needs be served. Criticism of the Imperial Munitions Board as of the original Shell Committee is developing both prominence and vindictiveness, although from an entirely different standpoint to that to which the latter body was subjected, and in meeting this situation let us just indicate what is involved, and where the Imperial Munitions Board stand relative to it.

One reason for the present dissatisfaction is due to the fact that the Board have had to cut out the making of 18-pdr. H. E. shells in Canada on definite instructions from the British Government. Orders for this type of shell were placed for the most part in Western Canada. Those concerned are kicking and to pacify them somewhat, the Imperial Munitions Board have placed some orders on their own responsibility, asking the firms to appreciate the situation.

In this matter of further manufacture in Canada of 18-pdr. H.E. shells, pressure of the most persuasive type and influence of the most powerful available was brought to bear on the Imperial authorities, but to no purpose. In view of this why, except through ignorance, or for the venting of personal spleen should the Imperial Munitions Board be denounced?

Another occasion for fault-finding has been because of the Board's business-like action in bringing unfilled contracts, made many months ago, under the penalty provision that the work must now be completed at several dollars less per shell or else the contract will be withdrawn. This is obviously a move which should receive public approval.

Russian Shell Contracts Being Acquired

A further evidence of the Board's desire to maintain plant activity in shell-making as far as lies in its power, is to be noted in the acquirement of a contract for half a million Russian 18-pdr. H.E. shells from the Canadian Car & Foundry Co., for distribution among Canadian firms who are prepared to undertake the work in varying quantities. The Russian 18-pdr. H.E. shell differs somewhat from that of the British, in that a ground finish is required; a lower price per shell comparatively is also offered, and a strict delivery time limit is set. Irrespective of these drawbacks, if they may be so termed, there is profit to be earned, even allowing for the necessary additional equipment, and there is several months' activity ahead for firms undertaking the work.

As an indication of the future policy of the Imperial Munitions Board, shell manufacture will be concentrated as far as possible in districts thickly set with machine shops, in consequence there is little likelihood of further orders going West of the St. Clair River. So far as the plants making 6-in., 8-in. and 9.2-in. shells are concerned, the orders placed will keep them going until February, 1917. Shrapnel and 4.5 H.E. shells now on order will last till this fall, and it is expected that further orders will be placed for these, although nothing additional is meantime in sight.

Manufacture of Fuses

Up till quite recently nothing had been done relative to the manufacture of shell fuses in Canada. This the Imperial Munitions Board have made it their business to attend to, with the result that contracts have been placed with three firms for a total of three million time and impact fuses, delivery in quantity being expected to materialize in mid-summer or early fall this year. Steps have also been taken to establish two shell-loading factories, one of these being established in Montreal and the other in Toronto.

The Imperial Munitions Board is attending to its business both in the securing of further orders from the Imperial Government and in the administration of contracts in process, and while additional shell contracts may be placed in the ensuing months, present conditions should be regarded as sufficiently ominous of an impending reduction in future quantity orders, if not of their altogether cessation as that "Planning for a Shell-less To-morrow" may not be longer postponed.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 75	
Ferro nickel pig iron (Soo)	25 00	
	Montreal.	**Toronto.**
Middlesboro, No. 3	$24 00	.....
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Glengarnock	28 00	.....
Summerlee, No. 1	33 00	.....
Summerlee, No. 3	32 00	.....
Michigan charcoal iron	28 00	.....
Victoria, No. 1	27 00	.....
Victoria, No. 2X	26 00	.....
Victoria, No. 2 plain	26 00	.....
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	2.75
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	2.75
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	2.50
Structural shapes	2.60
Plates	2.60

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

BOILER PLATES.

	Montreal	Toronto
Plates, ¼ to ½ in., 100 lb.	$3 00	$3 00
Heads, per 100 lb.	3 10	3 20
Tank plates, 3-16 in.	3 25	3 30

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$15 75	$15 25
Copper, crucible	19 00	18 00
Copper, unch-bled, heavy	18 75	17 50
Copper wire, unch-bled	18 75	17 50
No. 1 machine compos'n	14 50	14 00
No. 1 compos'n turnings	12 50	11 50
No. 1 wrought iron	11 75	11 00
Heavy melting steel	9 00	10 00
No. 1 machin'y cast iron	14 75	14 00
New brass clippings	11 75	11 50
No. 1 brass turnings	10 00	9 50
Aluminum	32 00	30 00
Heavy lead	6 00	6 00
Tea lead	5 00	5 00
Scrap zinc	13 50	13 50

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect Dec. 14, 1915:

	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
	Standard			
¼, ⅜ in.	60	36½	....	....
½ in.	65	45½	....	....
¾ to 1½ in.	70	50½	....	....
2 in	70	50½	66	46½
2½ to 4 in.	70	50½	69	49½
4½, 5, 6 in.	....	....	67	47½
7, 8, 10 in.	....	....	64	42½
	X Strong P. E.			
¼, ⅜ in.	53	36½	....	....
½ in.	60	43½	....	....
¾ to 1½ in.	64	47½	....	....
2, 2½, 3 in.	65	48½	....	....
2 in.	....	....	60	43½
2½ to 4 in.	....	....	63	46½
5½, 5, 6 in.	....	....	63	46½
7, 8 in.	....	....	56	37½
	XX Strong P. E.			
½ to 2 in.	41	24½	....	....
2½ to 6 in.	....	....	40	23½
7 to 8 in.	....	....	37	18½
	Genuine Wrot Iron.			
⅜ in.	54	30½	....	....
½ in.	59	39½	....	....
¾ to 1½ in.	64	44½	....	....
2 in.	64	44½	60	40½
2½, 3 in.	64	44½	63	43½
3½, 4 in.	....	....	63	43½
4½, 5, 6 in.	....	....	60	40½
7, 8 in.	....	....	57	35½

Wrought Nipples.

4 in. and under	75%
4½ in. and larger	70%
4 in. and under, running thread	55%

Standard Couplings.

4 in. and under	57½%
4½ in. and larger	37½%

The above discounts are under revision.

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto.
Lake copper, carload	$27 50	$27 50
Electrolytic copper	27 50	27 50
Castings, copper	27 00	27 00
Tin	45 50	45 50
Spelter	21 00	21 00
Lead	7 75	8 00
Antimony	45 00	43 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$33 00
Open-hearth billets, Pittsburgh	35 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	45 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 10	$3 05
Cut nails	2 90	3 00
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	3 45	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	65
Stove bolts	75 and 10
Plate washers	40
Machine bolts, ⅜ and less	57½
Machine bolts, 7-16 and over	47½
Blank bolts	47½
Bolt ends	47½
Machine screws, iron, brass	35
Nuts, square, all sizes	3c per lb. off
Nuts, hexagon, all sizes	3¼c per lb. off
Iron rivets	60
Boiler rivets, base, ¾-in. and larger	$4.10
Structural rivets, as above	4.00
Wood screws, flathead, bright	85 p.c. off
Wood screws, flathead, brass	50 p.c. off
Wood screws, flathead, bronze	45 p.c. off

LIST PRICES OF W. I. PIPE.

Standard. Nom. Diam.	Standard. Price. per ft.	Extra Strong, Sizes Ins.	Extra Strong, Price per ft.	D. Ex. Strong. Size Ins.	D. Ex. Strong. Price per ft.
⅛in	$.05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1½in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	....	....
7 in	2.38	7 in	3.81	....	....
8 in	2.50	8 in	4.34	....	....
8 in	2.88	9 in	4.90	....	....
9 in	3.45	10 in	5.48	....	....
10 in.	3.20	....	....	....	....
10 in.	3.50	....	....	....	....
10 in.	4.12	....	....	....	....

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	25%
At warehouse	15%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS

Solder, half-and-half	0.24½
Putty, 100-lb. drums	2.85
Red dry lead, 100-lb. kegs, per cwt.	9.87
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.28½
Benzine, single bbls., per gal.	0.28
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	1.09
Linseed oil, boiled, single bbls.	1.12
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	5.00
Lead Wool, per lb.	0.11
Pure Manila rope	0.18½
Transmission rope, Manila	0.23½
Drilling cables, Manila	0.21½
Lard oil, per gal.	1.10
Union thread cutting oil	0.60
Imperial quenching oil	0.35

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 40%

PROOF COIL CHAIN.

¼ in.	$9.00
5-16 in.	5.90
⅜ in.	4.95
7-16 in.	4.55
½ in.	4.00
9-16 in.	4.20
⅝ in.	4.10
¾ in.	3.95
⅞ in.	3.80
1 inch	3.70

Above quotations are per 100 lbs.

TWIST DRILLS.

	%
Carbon up to 1½ in.	55
Carbon over 1½ in.	25
High Speed	
Blacksmith	55
Bit Stock	60 and 5
Centre drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 50	$3 75
Canada plates, dull, 52 sheets	3 50	3 60
Canada Plates, all bright	4 60	4 75
Apollo brand, 10¾ oz. galvanized	6 40	6 50
Queen's Head, 28 B.W.G.	6.75	7 00
Fleur-de-Lis, 28 B.W.G.	6 50	6 75
Gorbal's Best, No. 28	6 40	6 40
Viking metal, No. 28	6 10	6 10
Colborne Crown, No. 28	6 00	6 50
Premier No. 28, U.S.	6 50	6 50
Premier, 10¾ oz.	6 75	6 75

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$17 00	.....
1¼ in.	17 00	.....
1½ in.	17 00	11 55
1¾ in.	20 00	11 55
2 in.	20 00	11 00
2¼ in.	22 00	12 10
2½ in.	24 00	14 15
3 in.	32 00	14 60
3½ in.	35 00	18 00
4 in.	40 00	23 00

Prices per 100 feet, Montreal and Toronto.

WASTE.

WHITE.	Cents per lb.
XXX Extra	0 15¼
Grand	0 14
X L C R	0 12¾
X Empire	0 11½
X Press	0 10¼
COLORED.	
Lion	0 09
Standard	0 08
Popular	0 07
Keen	0 06
WOOL PACKING.	
Arrow	0 20
Axle	0 14
Anvil	0 10
Anchor	0 08
WASHED WIPERS.	
Select White	0 09
Mixed Colored	0 07
Dark Colored	0 05½

This list subject to trade discount for quantity.

BELTING RUBBER

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble, 40 & 10%	
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$12.75
3-16 in.	8.85
¼ in.	6.15
5-16 in.	4.90
⅜ in.	4.05
7-16 in.	3.85
½ in.	3.75
⅝ in.	3.60
¾ in.	3.60

Prices per 100 lbs.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.06
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy.	.30
Copper sulphate	.15
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	3.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.20
Zinc sulphate	.07

Prices Per Lb. Unless Otherwise Stated.

ANODES

Nickel	.47 to .52
Cobalt	1.75 to 2.00
Copper	.27 to .30
Tin	.45 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs	.4½ to .06
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.04 to .06
Emery composition	.07 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., Jan. 3, 1916.—Very little change is noted in the irregular and complicated conditions that still prevail in the various markets. The abnormal situation on all sides is apparently not fully comprehended by many of those vitally interested at the present time, and the prospects for the future seem clouded with doubt and uncertainty. It is with some feeling of anxiety that the trade is looking forward to the future developments.

Pig Iron

The capacities of most foundries are still taxed to the utmost, the output in many instances being sold for the first and second quarters. Many selling agents report that orders booked to date will ensure them very good business without further effort. The market at present is quiet and inactive, as most consumers are well supplied for immediate and early future needs. However, some indications of further buying have recently developed and third and fourth quarter inquiries are gradually increasing. Heavy inquiries for foreign tonnage are creating a stir among the Bessemer iron producers, as a shortage is apparent and it is expected that prices on steel-making iron may shortly be advanced.

No change is quoted in the local prices.

Steel

No cessation of activity is evident throughout the steel industry, and producers are using every facility to meet the requirements of the enormous demand, which is and has been for some time, greater than at any previous time in the country's history. Owing to difficulty experienced in shipping facilities, both by rail and water, considerable delay in delivery is reported from many points. Owing to the increased freight on ocean traffic and the scarcity of tonnage, no definite time of delivery is possible for export shipment. The demand for semi-finished steel is not heavy, but mills are busy filling orders, and every lull is welcomed by producers as it enables them some prospect of catching up with the requirements of the consumers. Mills are loth to accept second quarter delivery for steel bars. Billets are strong at last week's prices. Boiler plates are still in great demand, car builders' and marine requirements calling for large supplies. Many of the large plate mills are sold out for the first six months and are booking third quarter orders; 1/4 to 1/2-inch plates are firm at $3.00. Tank plates are strong at $3.25, and heads are quoted at $3.20, the latter being an advance of 10 cents per hundred lbs. Trade in blue annealed sheets is very active, the mills working to capacity in order to supply the demand. Very little booking is available for first or second quarter and dealers are anxious to place orders for advanced periods, but the makers are reluctant in their acceptance.

The market in nuts and bolts is very strong and indications of a further advance are apparent.

Metals

The metal market is practically unchanged and while foreign reports indicate strength along certain lines, local dealers are refraining from changing prices in the hope or expectation that the near future may see a steadier market. London prices on copper have advanced, also lead and spelter, while other metals are quiet, but firm. Local conditions show little change over last week, with trade reasonably good.

> **CANADIAN GOVERNMENT PURCHASING COMMISSION**
>
> **The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.**

Copper—The irregular situation which has prevailed for the past month or so still has the effect of keeping the market in a state of uncertainty, and no definite information is available as to the exact conditions. Much anxiety is shown among a large number of buyers regarding the future outlook.

The action of the British Government in stating a fixed figure to be paid for copper has given little relief to the London market, as many consumers are unable to secure satisfactory replies to their requests for material. Continued reports of large inquiries from foreign agents with orders pending, has a tendency to strengthen the market. Recent rumors of 30-cent copper were apparently unfounded, but had the effect of raising quotations. A certain feeling is abroad that producers are witholding facts that might throw a better light upon the situation.

The market here, while showing the tension of foreign conditions, remains unchanged. Dealers report fair inquiries for future; little or no requests for immediate delivery noted, as local consumers appear well supplied for present needs. Quotations are firm at $27.50 for lake and electrolytic, and $27.00 for castings.

Tin—London reports that permits for foreign shipments are becoming more general, and are giving considerable relief to an otherwise uncertain condition. Considerable tin is at present available, both for spot and early future, as much of the metal now afloat remains unsold, but buyers are anxious to cover their requirements for the coming half year, and prices are expected to remain firm, as the future supply shows signs of uncertainty. Local prices are unchanged at 45 1/2 cents a pound.

Spelter—The present market is quiet, but firm. Inquiries for spelter have been light, but the past few days have shown increased interest, and several bids for February and March delivery are reported. The galvanized trade is comparatively light and little business is recorded along these lines. Foreign quotations indicate a stronger market, but local prices remain firm, with dealers asking 21 cents per pound.

Lead—Owing to the apparent speculation recently among the large dealers, the British munitions department are considering the advisability of placing further restrictions upon the sale of lead, following a report that quantities of metal were being witheld from the market. However, regular reports of available lead are now being furnished, and the anxiety now shown may only be of a temporary nature, as the authorities are using every means to obtain a clear understanding of the present situation. The recent advance quoted on the London market was immediately followed by a similar advance on the New York market. However, Montreal dealers are holding firm at last week's quotation of 7 3/4c per pound.

Antimony—Quotations on early delivery are strong and firm, with few inquiries for futures. The local situation is unchanged, with dealers quoting 45 cents per pound.

Aluminum—Quiet and unchanged at 68 cents a lb.

Machine Tools and Supplies

Inquiries for machine tools are not so numerous now, as the requirements of shell-makers have almost been filled. However, the machine tool builders are busy with orders placed last year and also with the heavier tools required for large shells. These machines are gradu-

ally being delivered to various plants. A large quantity of shell fuses are still required, and developments are under way to establish suitable factories for these parts.

The prices on supplies are constantly increasing; owing to the steel situation, many of the dealers and makers of small tools have been forced to revise their price lists, many lines showing substantial increases. The increased cost of high-speed steel has developed many changes in the prices of drills, taps, reamers and cutters, steel of this quality being now quoted at about $3 per pound. Coupled with the unusual condition in steel, is the constantly increasing cost of oils and other manufacturing accessories. Added to the increased demand for domestic purposes, large foreign enquiries for tools and supplies are keeping both the American and Canadian manufacturer busy figuring on the possibilities of future trade developments.

Old Materials

The abnormal situation at present prevailing in the copper market has resulted in a further advance of scrap copper, and light is now quoted at $15.75; crucible $19.00; heavy, $18.75; and copper wire, $18.75. No. 1 machine composition has advanced to 14½ cents a lb. and composition turnings are now quoted at 12½ cents. No. 1 brass turnings show an increase of ¼ cent, this week's price being 10 cents per pound. Aluminum is stronger at 32 cents per pound. General trade is good, with dealers reporting fair business.

Toronto, Ont., Feb. 1.—Industrial conditions generally continue to improve, the volume of business for the month just closed being considerably greater than for the coresponding month of last year. The financial situation has also improved as a result of war orders and the more economical tendency generally. There is much less speculation than formerly and business is being conducted on more conservative lines. Machinery houses report that business is much quieter than it was a few months ago and is becoming more nearly normal. The steel trade is as active as ever and the situation is unchanged. Coal and coke are rising in price and shipments are being delayed owing to congestion on the railways and shortage of labour at the mines and coke ovens. The ingot metal market is firm and prices for most metals have been maintained at last week's levels, with the exception of antimony which is higher. Prices generally are very firm with an upward tendency. Prices of some products have advanced, such as coal and coke, seamless boiler tubes, dry red lead, ropes, wrought iron pipe.

Steel Market.

The situation in the steel trade is unchanged and the market is very strong. Prices of all iron and steel products are very firm with an upward tendency. Chicago warehouse prices for steel bars plates and shapes have advanced 10c and bars are now quoted at $2.50, with plates and shapes $2.60 per 100 lbs. Higher prices for seamless boiler tubes have been announced, new prices being about $3 per 100 feet higher than the previous level. Cost of production has increased and considerable difficulty is being experienced in getting delivery. The anticipated advance in wrought iron pipe is now in effect and the market is very firm. The new list affects both black and galvanized pipe. There has been no change in cold rolled steel shafting, but discounts are purely nominal as makers say that they have no shafting to sell in the open market for the first half of the year. Quotations on wire rods are also nominal as makers have their output sold up for some months ahead. Higher prices for wire nails are anticipated as the cost of wire rods continues to increase.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

The galvanized sheet market is very firm and higher prices may be expected any time. There is no improvement in the situation as regards raw materials which are steadily getting more costly. Some makers of galvanized sheets in the States are practically out of the market owing to the high cost of raw materials. The market for black sheets is also very firm and higher prices are looked for.

The steel market in the States continues very strong and still higher prices on all steel products are expected. The outlook in the trade is very bright as it is apparent that the mills will operate at full capacity throughout the year; in addition it is very probable that the present buying movement will continue well into 1917. Steel bars are now being quoted at 2.10c and iron bars at 2.00c f. o. b. Pittsburgh. Prices of billets are firm but unchanged. A shortage in the supply of ferro-manganese has developed and buyers are paying all kinds of fancy prices for prompt delivery. The nominal price for ferromanganese is $125 with no guarantee as to deliveries but prompt shipments would readily bring $150 per ton tidewater.

Pig Iron.

The market is quieter but the demand for steel-making grades of pig iron is as strong as ever. There has been some improvement in the demand for foundry iron but conditions in this regard are below normal. Prices of all brands of pig iron are unchanged.

Coal and Coke.

The situation in the coal and coke trade is unsettled and prices are advancing. Supplies are very difficult to obtain on account of the congestion of traffic on the railroads and labour shortage at the mines. Prices of solvay foundry coke have been withdrawn, it being impossible to quote firm prices owing to the conditions prevailing and difficulty of getting shipments. The higher prices have affected soft coal more than anthracite although the latter has also advanced.

Machine Tools.

The machine tool market is practically normal again, the demand having fallen off considerably as compared with the boom of last year. Fair business is being done in lighter tools for making shell parts and the demand should improve when the plants for making time fuses are being equipped. Makers of machine tools in the States are raising their prices and on this account it is difficult to get firm quotations unless for prompt delivery. Owing however to the improved domestic demand in the States for machinery, deliveries are still backward, making it difficult to do business. Russian interests are buying heavily in the States which is also helping to keep the makers busy. A local machinery house has met with considerable success in the States with a special line of machinery.

Supplies

The market continues very firm and prices on some supplies have advanced. Ropes have advanced on account of the increase in cost of raw materials. Stocks of manila in the hands of importers are light. High freight rates and scarcity of tonnage are also important factors influencing the market. Pure manila has advanced 1c and is now quoted at

18½c per pound. Transmission rope and drilling cables have advanced 2c and are quoted at 23½c and 21½c per pound respectively. Dry red lead is higher due to the steady advance in pig lead, and is now quoted at $9.87½ per 100 lbs. in keg. The linseed oil market is weaker but prices are unchanged although there is a possibility of lower prices prevailing temporarily. Gasoline and benzine are unchanged but higher prices are anticipated owing to the continued strength in the crude oil market. Prices of crude oil have recently advanced 10c in the States. Pennsylvania crude being now quoted at $2.35.

Old Material.

Conditions in the market for old materials are unchanged. There is a good demand for scrap copper and lead and quotations are very firm. Wrought iron and steel scrap are quieter and prices unchanged.

Metals

The metal markets are steady and prices unchanged except for antimony which has advanced. The copper situation is the most interesting feature as the question of supply and demand has become very important and a scarcity of copper is now likely. The tin situation in New York is easier as abundant supplies of this metal are coming over notwithstanding the so-called restrictions placed on the export of tin by the British Government. At one time it was thought that the trade would be inconvenienced but apparently the expected has not happened. The spelter situation is unchanged but the high prices are seriously affecting the galvanized sheet trade. The lead market is firm and unchanged. Antimony is higher and prices nominal, while the aluminum situation is unchanged.

Copper.—The market is very strong but the position is extremely complicated due to the recent regulations issued by the British Government to fix the price of copper. The position of copper however, is a very strong one on account of the enormous demand for this metal for munitions. This demand will exist while the war lasts and the end of the war will probably find world's supplies of copper practically exhausted and which will have to be replenished. The heavy demand therefore will no doubt continue for some time after the war stops, indications thus point to higher prices. Copper is unchanged and nominal at 27½c per pound.

Tin.—The market is active and prices unchanged. The situation is easier in New York as considerable supplies of tin are being imported, it being at one time expected that the regulations issued by the British Government would inconvenience the trade. Quotations are unchanged at 45½c per pound.

Spelter.—The market is dull and situation unchanged. There is a heavy demand for brass mill spelter but the price is too high to interest the galvanizing trade. Spelter is quoted at 21½c per pound.

Lead.—The market is firm and unchanged. The "Trust" price of 6.10c. New York is being firmly held. The lead market in London is weak owing to the announcement that the British Government propose controlling prices to prevent speculation. Locally quotations are unchanged at 8c per pound.

Antimony.—The market is strong and higher. There is a good demand for prompt and early deliveries but futures are neglected. Antimony has advanced 3c and is now quoted at 43c per pound.

Aluminum.—The situation is unchanged and market firm. Aluminum is quoted at 68c per pound.

Solder.—Prices are firm and unchanged, with half-and-half quoted at 24½c per pound.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

CANADIAN RAILWAY CLUB DINNER

RAILWAYS and their share in war work, from manufacturing ammunition to the movement of troops, constituted the keynote of the annual dinner of the Canadian Railway Club at the Windsor Hotel, Montreal, on Saturday evening, January 29. This warlike spirit was further emphasized by the presence of Major-General Sir Sam Hughes, Brig.-General E. W. Wilson and other officers.

Further evidence that the railway companies were interested in war work was given by the decorations, the lamps at the head table being made from two 18-pounder shrapnel shells, which proved such effective decorations that they called for warm praise from General Hughes, who will be presented with one of these unique lamps. The menus also were in the form of shrapnel shells, with every detail complete, even to the copper bands.

The president, L. C. Orde, is absent on active service, and his place was taken by the vice-president, R. M. Hannaford, assistant chief engineer of the Montreal Tramways Co. Amongst the guests were Messrs. E. F. Gutelius, general manager of Canadian Government Railways; R. C. Wilkins, president of the Dominion Commercial Travellers' Association; J. Coleman, superintendent of the Car Department of the Grand Trunk; Prof. Bancroft, of McGill; F. Barbery, J. Cade, secretary of the New England Railway Club, Boston; Wm. McNab, valuation engineer, Grand Trunk; T. C. Hudson, master mechanic, C.N.R.; T. McHattie, master mechanic, Grand Trunk and C. Manning, mayor of Verdun; W. Manning, B. & M. Ry.

There were nearly two hundred guests present, these including a number of prominent railway men from New York, Boston, Philadelphia, Chicago and other United States points.

After "The King" had been duly honored, the chairman presented another national toast, "Our Members at the Front." This was proposed by Wm. McNab, and responded to by Major-General Sir Sam Hughes, who was given a most enthusiastic reception. The Minister of Militia paid a warm tribute to the manner in which the Canadian Railways and their employees had met the war emergency, both by their work and by sending men to the front. Many good railway men, he said, were included in the ranks of those already in the trenches, and many more had joined other battalions to be sent.

Sir Sam also pointed out the splendid work that had been done by the Canadian railways in the transportation of troops, which had made the first hurried mobilization of men at Valcartier possible. Not only were the railways, he said, doing patriotic and valuable service in regard to the movement of troops, but they had achieved wonders in the production of munitions of war at a time when they were very badly needed. Canada, said Sir Sam, was doing magnificent work in connection with the war, and the Canadian railroads were taking a leading part in this work in every way. The Minister especially complimented the Government railways on the manner in which they had risen to the emergency.

During the evening an excellent musi-

cal programme was carried out, songs being rendered by Mme. Lea Choiseul and Messrs. Bissett, Dumbrille and "Jock" Hunter, and recitations given by Bevans Giles.

SHIPMASTERS' ASSOCIATION

THE Shipmasters' Association in session at the Carls-Rite Hotel, Toronto, last week, elected officers as follows: Grand president, W. J. Crosby, Detroit; grand first vice-president, A. W. Stalker, Toledo; grand second vice-president, J. B. Mann, Toronto; grand secretary, Walter Hamilton, Chicago; grand treasurer, J. H. McDonald, Toledo; grand marshal, J. W. Kelley, Port Huron; grand chaplain, Chas. Nelson, Ogdensburg; grand warden, S. H. Kenworthy; grand sentinel, W. A. Lavigne, Midland, Ont. It was decided that the next annual convention should be in Cleveland, Ohio. Members expressed themselves as very well pleased with Toronto, and the feeling was unanimous that the convention should be brought back to that city in the near future.

Trade Gossip

C.P.R. Curtail Extensions — Grant Hall, vice-president and general manager of the C.P.R.'s Western lines, has returned to Winnipeg from Montreal, where he was in consultation with vice-president George Bury, regarding appropriations for 1916. In view of the financial outlook it has not been decided to proceed with the building of any new lines, but this matter will be given further consideration in the spring should conditions then warrant it. There is no possibility of the Company embarking on any ambitious scheme during the continuation of the war. The necessary money for the completion of Rogers Pass Tunnel has been allotted, and that work will be finished this year. With a view to maintaining the roadbed in good condition, more than one hundred and fifty miles of track will be relaid with heavy rails, and there will be a considerable expenditure on ballasting, bank widening and other work of that character.

C.N.R. Western Lines — M. H. McLeod, general manager of the C.N.R., who has just returned to Winnipeg from Toronto, where the appropriations for the year were under discussion, states that the programme for the lines in the West during the ensuing year would be marked by that progressiveness which has characterized the policy of the company in the past. The road would be maintained in the highest standard of efficiency and improvements would be made where necessary. Rails would be laid on all branch lines that have been graded as well as the extensions, so as to enable the railway to take advantage of the anticipated improved conditions throughout the West.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Toronto, Ont.—Wright & Co., 30 Mutual Street, is in the market for an electro-plating dynamo.

Montreal, Que.—The G. T. R. is rebuilding its machine shop at Point St. Charles, which was recently destroyed by fire.

Toronto, Ont.—The Canada Metal Co. have been granted a permit to build a $4,000 shot-tower at their factory on Fraser Avenue.

London, Ont.—The Perkins Gasoline Engine Co., of Mishawaka, Ind., have started operations at their plant recently established here.

Toronto, Ont.—The Canada Pipe & Steel Co. ask permit to make a substantial addition to their machine shop on Atlantic Avenue.

Toronto, Ont.—The Dunlop Tire and Rubber Co. have made application for a permit to build an addition to their factory on Booth Avenue.

Gananoque, Ont.—The Steel Company of Canada have taken over factory of the Gananoque Bolt Co., and will install a drop forging equipment.

Toronto, Ont.—The Universal Tool Steel Co. will construct a one-storey brick addition to its plant on Dufferin Street. Estimated cost, $7,000.

Ottawa, Ont.—The C. N. R. plans to construct repair and car shops and round house at Rideau, near here. A. J. Hills, Toronto, general superintendent.

Toronto, Ont.—The Hamilton Gear Machine Co. have been granted a permit to erect a one-storey steel and concrete addition to their present building at the south-east corner of Concord avenue and Van Horne street. The improvement is estimated to cost $4,500.

Municipal

Maisonneuve, Que.—The City council are considering installing an incinerator.

Wellesley, Ont.—The Town Council will install an electric light distribution system.

Gravenhurst, Ont.—The by-law has carried to authorize an expenditure of $3,500 on changes to the street lighting system.

Amherstburg, Ont.—The Town Council are considering the question of installing an improved street lighting system.

Kingston, Ont.—The Utilities Commission are negotiating with the Seymour Electric Co., for the sale of 1,000 to 3,000 h.p. at $25 per h.p. per annum.

Chatham, Ont.—The city is negotiating with a company who contemplate establishing a shoe factory here. The old Wolverine Co. plant may be taken over.

Toronto, Ont.—It is proposed to build a subway on Ashdale Avenue at an estimated cost of $33,000. The plans have been passed by the Dominion Railway Board.

New Toronto, Ont.—As the result of the increased supplies of water required by several local industries it will be necessary to enlarge the local waterworks system.

Collingwood, Ont.—The Town Council propose making improvements to the waterworks system which include the installation of a motor-driven turbine pump and a water tank. Chipman & Power of Toronto, are the consulting engineers.

General Industrial

Windsor, Ont.—The Universal Stove & Furnace Co. contemplate erecting a plant here or in Walkerville.

PortArthur, Ont.—The Davidson & Smith Co., are considering building an addition to their elevator here.

Woodbridge, Ont.—Edwards & Co., of Toronto, have leased the old American-Abel Co. factory and will manufacture leather products.

Toronto, Ont.—Fire in the three-storey brick building belonging to the Gold Medal Furniture Co., corner Bartlett and Van Horne streets, did $800 damage recently. Insurance covers the loss.

Electrical

Guelph, Ont.—Machinery is being installed in the transformer station, here and the last of the poles for the transmission line have been erected.

Tenders

Hamilton, Ont.—Tenders will be received by the chairman Board of Control, up to February 7, 1916, for supplying mechanical rakes and appurtenances and travelling hoist and grab bucket (one-half cu. yd. capacity), and appurtenances for Gage Avenue pumping station. Plans, specifications, and further details can be obtained upon application to the city engineer's office.

Ottawa, Ont.—Tenders will be received until Monday, February 28, 1916, for the construction of timber lock gates and their equipment for the East River Lock, near New Glasgow, Pictou County, N.S. Plans and forms of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the district engineers at Antigonish, N.S.; Halifax, N.S.; Shaughnessy Building, Montreal, P.Q.; Confederation Life Building, Toronto, Ont., and on application to the Postmaster at New Glasgow, N.S.

Departmental Dredging Plant.—Separate sealed tenders addressed to R. C. Desrochers, secretary Department of Public Works, Ottawa, will be received until February 15, 1916, for the supply of brooms and brushes, chain, coal, hardware, hose, oils and greases, packing, paint and paint oils, Manila rope, wire rope, steam piping, valves and fittings, for the requirements of the Departmental Dredging Plant in Ontario and Quebec during the fiscal year 1916-1917. Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures. These forms can be obtained at the Department of Public Works, Ottawa.

Building Notes

Renfrew, Ont.—The South Renfrew Agricultural Society have decided to erect a machinery hall at a cost of about $3,000.

Dundas, Ont.—The Board of Education will erect a school building. estimated to cost $6,000. Oborn & Ellis are the architects.

St. John, N.B.—The Dominion Government will, it is reported, erect a sub-

stantial building here for the use of the Immigration Department.

London, Ont.—The Board of Education have appointed Watts & Blackwell and A. E. Nutter as architects for the proposed technical school.

Toronto, Ont.—Preparations are being made to proceed with the erection of the new Princess Theatre. Charles J. Read, of Toronto, is the architect.

Hamilton, Ont.—The Royal Hamilton Yacht Club will build a new club house near the old site. McPhie, Kelly & Darling, of this city, are the architects.

Sarnia, Ont.—Watt & Blackwell, architects, of London, Ont., are preparing plans for a new school for the Separate School Board, to cost $15,000.

Ottawa, Ont.—The Toronto, Niagara and Western Railway is applying to Parliament for authority to increase the bonding powers of the road to $75,000 a mile.

St. Boniface, Man.—It is proposed to erect an addition to the Provencher School at an approximate cost of $65,000. A by-law will be submitted to the ratepayers.

Brantford, Ont.—The City Council have passed the third reading of the by-law authorizing the sale of the Paris-Galt and of the Grand Valley line to the Lake Erie & Northern Railway for the sum of $30,000, and the electrification of the L. E. & N. Railway from Galt to Port Dover, Ont.

Personal

C. D. Campbell, city engineer of Galt, Ont., has resigned.

James English, consulting engineer of Winnipeg, Man., has been appointed manager of the Port Arthur Street Railway Co.

Wilford Phillips, manager Winnipeg Electric Railway Co. has left for California on a vacation of several months on account of his health.

Capt. Paul F. Sise, vice-president and general manager of the Northern Electric Co., Montreal, has been appointed adjutant of the 148th Battalion, Montreal.

J. C. Breckon, formerly waterworks engineer for the city of Vancouver, B.C., is now associated with the engineering firm of Du Cane, Dutcher & Co., Vancouver.

Mark Workman a prominent financier of Montreal, Que., has been appointed president of the Dominion Steel Corporation in succession to J. H. Plummer who has resigned.

George Hogarth, of the engineering staff of the Department of Public Works, has been appointed Chief Engineer of Highways for Ontario, succeeding W. A. McLean, now Deputy Minister of Highways.

J. H. Plummer for the past six years president of the Dominion Steel Corporation has retired from the active management of the company in order to take an extended holiday in Europe for the benefit of his health.

John B. McDonald, who conducted a foundry at Tiverton, Ont., for many years, died there on January 31. The deceased was born at Ross Mull, Argyleshire, Scotland, 78 years ago, and settled in Tiverton at the age of 18.

George Patterson, who has been general superintendent of the John Goodison Thresher Co., Sarnia, Ont., has accepted a position as general superintendent for the National Manufacturing Co., of Ottawa and Brockville, Ont.

A. W. Wheatley, vice-president and general manager of the Canadian Locomotive Co., Kingston, Ont., has resigned to assume the presidency of the Lima Locomotive Co., Lima, Ohio. Mr. Wheatley will leave Kingston about April 1.

Angus B. McColl, founder of McColl Bros. & Co., Toronto, died last Saturday at his residence, 289 Carlton Street. The deceased was born in Kilmelfort, Argyleshire, Scotland, in 1834, and when about ten years of age came to Canada. In 1878 he founded a large lubricating oil business in Toronto, Ont.

EQUIPMENT FOR AUSTRALIAN NAVAL DOCKYARD

Tender forms and specifications have been forwarded by D. H. Ross, Trade Commissioner, Melbourne, for 43 machines of various types required for the equipment of the Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W. Tenders will be received, subject to the conditions specified, up to May 1, 1916, addressed to the Director of Navy Contracts, Melbourne, Australia. The last mail in time to reach Melbourne on May 1 is that leaving San Francisco on March 22 and due at Melbourne on April 12. The tender forms are open to the inspection of Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer file No. A-1435). Particulars of the requirements are briefly outlined thus:

Three 50-ton overhead travelling cranes.

One 25-ton overhead travelling crane.

Two 5-ton overhead travelling cranes.

One 10-ton revolving cantilever crane.

Two 5-ton travelling portal jib cranes.

Two 7½-ton jib cranes.

One 5-ton jib crane.

Two 15-ton hydraulic cranes.

One 6-ton hydraulic crane.

One 6-ton wall crane (hydraulic).

Two 3-ton wall cranes (hydraulic).

Two electric passenger elevators.

Two electric goods elevators.

One 2½-ton gauge locomotive with crane attached.

One 2½-ton gauge locomotive without crane attached.

Three electrically-driven air compressors, 1,500 cu. ft.

One 15-ton hydraulic winch.

One 5-ton hydraulic winch.

Nine 10-ton hydraulic capstans.

Two 5-ton hydraulic capstans.

One bar shearing machine.

One double-ended horizontal punching machine.

One 10-ton overhead travelling crane for shipyard fitting shop.

Contracts Awarded

St. Thomas, Ont.—At a meeting of the St. Thomas Hydro-Electric Commission recently, the contract for the erection of the new sub-station, which is to be built at the corner of Gas and St. Catharine Streets, was awarded to A. E. Ponsford, Ltd., for the sum of $16,279, this being the lowest bid received.

Trade Gossip

The McClary Mfg. Co., of London, Ont., has received a $100,000 order for field kitchens.

The Maxwell Motor Co., of Detroit, Mich., propose to establish a branch plant at Windsor, Ont.

The Consolidated Mining and Smelting Co. of Canada, Ltd., has increased its capital stock to $15,000,000.

Trail, B.C.—It is reported that the Consolidated Mining and Smelting Co. will establish a copper refining plant here.

The Canadian Steel Foundries, Ltd., have completed the installation of a 30-ton open-hearth furnace at Longue Pointe, Montreal.

E. Laurie, of the E. Laurie Co., Montreal, agents of the DeLaval Steam Turbine Co., is now in England, having joined the Aviation Corps there.

The Canadian General Electric Co., Montreal, Que., have been awarded a contract for electric equipment by the Grand Mere, Que., Town Council.

Hamilton, Ont.—It is announced that an item of $250,000 will be placed in estimates at this session of Parliament for improvement work at Stipes inlet.

The Main Belting Co. have reopened their office at 32 Front Street, Toronto, where they will carry a full line of all sizes of their belting to ensure prompt delivery. S. R. Walsh will be local manager.

Montreal, Que.—It is announced that the Willys-Overland Co., of Canada, will maintain the branch at No. 5 Park Ave., formerly occupied by the Russell Motor Co., whose business has been taken over by the former.

The Chalmers Motor Car Co. of Detroit, Mich., was incorporated under the laws of Ontario last week with $100,000 capital as the first step towards the erection of a branch plant in either Windsor or Walkerville, Ont.

Shell Box Orders.—The Imperial Munitions Board recently placed an order for 50,000 boxes for 4.5 brass cartridge cases. Tenders were called, and these ranged from $1.22½ to $4 per box. The order was placed at the lowest price quoted.

Russian Shell Orders.—The Imperial Munitions Board is officially informed that there is no truth in the statements which have appeared recently to the effect that the Russian Government is negotiating the placing of orders for ten million shrapnel and high explosive shells in the United States.

Kingston, Ont.—Mayor Richardson and T. J. Rigney, representing the Kingston Utilities Commission, have been in Toronto attending Eastern Ontario municipalities representatives' conference with Sir Adam Beck regarding power development for this district.

Toronto, Ont.—The proposed warehouse for the Robert Simpson Co. will cost about $500,000. The building will be 155 feet high, with a frontage of 279 feet and a depth of 115 feet. Burke, Horwood & White, of Toronto, are the architects, and Wells Bros of Canada., Ltd., are the general contractors.

Grain Elevator Contracts.—Robert F. Durham, vice-president of John Metcalf, Montreal, who has been in Australia for some months, has signed agreements with several State Governments to design and construct a number of grain elevators. The contracts are estimated to total between four and five million pounds sterling.

Mineral Output of British Columbia.—The annual mineral output of British Columbia is valued at approximately $30,000,000. The figures for 1913 exceeded that amount, while the product last year was some $4,000,000 short of that of the previous year. The decrease in the value of minerals produced in the province last year, as compared with 1913, was due to the European war, which disturbed the metal markets throughout the world, producing a depressing effect on the industry in British Columbia.

New Incorporations

The Semans Electric Light Co. has been incorporated, with a capital of $10,000, to carry on business at Semans, Sask.

The Granville Vulcanizing Co. has been incorporated at Victoria, B.C., with a capital of $10,000, to carry on business at Vancouver, B.C.

Munitions and Machinery Co. has been incorporated with a capital of $100,000, to manufacture munitions at Sorel, Que. Incorporators: W. P. O'Connor, A. P. O'Connor and W. B. McLean.

The Canada Soaps, Ltd., has been incorporated at Toronto, with a capital of $100,000, to manufacture soaps. Head office at Toronto. Incorporators: Leopold Macaulay and William Thomas Sinclair, of Toronto.

The Prescott Mfg. Co. has been incorporated at Ottawa, with a capital of $200,000, to manufacture all kinds of abrasive wheels, etc., at Prescott, Ont. Incorporators: J. P. Dunne, J. B. White and M. J. Coffey, all of Prescott, Ont.

The Pine Grove Milling Co. has been incorporated at Toronto, with a capital of $40,000, to carry on the business of millers. Head office at Pine Grove, Ont. Incorporators: William John McCallum and Harvey Lorne McCallum, of Toronto.

The Chalmers Motor Co. of Canada, Ltd., has been incorporated at Ottawa, with a capital of $100,000, to manufacture motor cars at Windsor, Ont. Incorporators: Hugh Chalmers, Clarence A. Pfeffer and S. H. Humphrey, all of Detroit, Mich.

Canadian Steelwork, Ltd., has been incorporated at Ottawa, with a capital of $5,000, to manufacture structural steel, etc., at Welland, Ont. Incorporators are: R. W. Knight and J. A. Cowan, of Welland, Ont.; also F. R. Schneider, of Pittsburgh, Pa.

The Burton-Munro Mines, Ltd., has been incorporated at Toronto, with a capital of $1,000,000, to acquire and develop mines and mineral lands. Head office at Toronto, Ont. Incorporators: George R. Sproat and Franklin Metcalfe McDowell, of Toronto.

The Perfection Tire & Motor Co. has been incorporated at Toronto, with a capital of $1,500,000, to manufacture automobiles and accessories, at Hamilton, Ont. Incorporators: Charles Rufus Cole, James Hallett Christian and Larkin A. Rockwell, of Hamilton, Ont.

Munitions and Machinery, Ltd., has been incorporated at Ottawa, with a capital of $100,000, to manufacture shells, bombs, cartridge cases, etc., at Lorel, Que. Incorporators are A. P. O'Connor, W. P. O'Connor, of Huntingdon, Que., and W. B. McLean, of Lachine, Que.

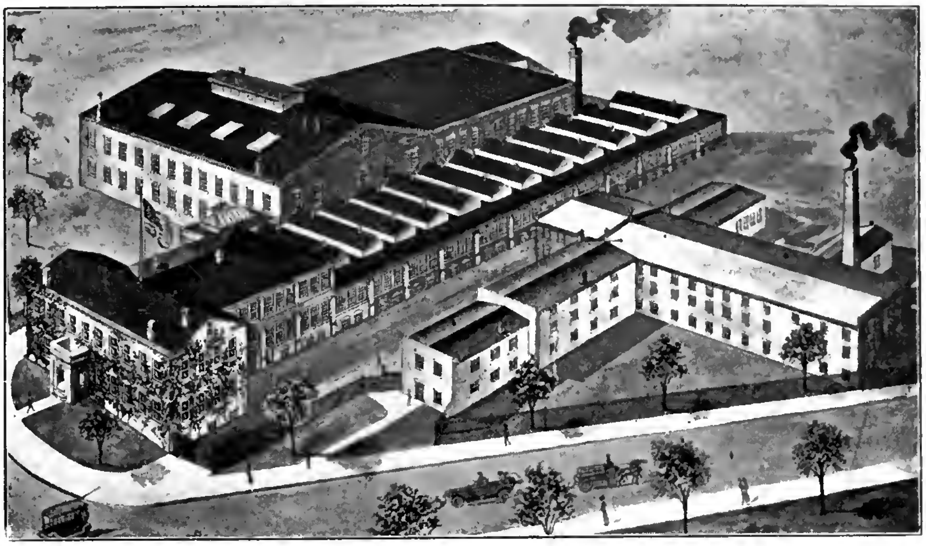
Wilson Munitions, Ltd., has been incorporated at Ottawa, with a capital of $50,000, to carry on business as mechanical engineers and build all kinds of machinery and munitions. The head office is at Toronto, and the incorporators are Robert McKay, David Grant and Mervil MacDonald, all of Toronto.

The Canadian Meter Co. has been incorporated at Ottawa, with a capital of $200,000, to manufacture meters of every description, also all kinds of measuring devices for water, gas and electricity, etc. Head office is at Hamilton, Ont., and the incorporators are J. B. McNary, E. H. Ambrose and J. P. Marshall, all of Hamilton, Ont.

Refrigeration

Windsor, Ont.—The Essex Provision Co. which has recently been incorporated are building a cold storage plant here.

Knock at our Door with an Inquiry or an Order, and you will find yourself Well Served



Geometric Tools are furnished in many sizes and types for all classes of internal and external thread-cutting, and to suit all makes of Screw Machines.
We make nothing but Thread-Cutting Tools, and thus maintain in them our standard:—"Finest Quality, Greatest Quantity, at Least Outlay."

THE GEOMETRIC TOOL COMPANY **NEW HAVEN, CONN., U.S.A.**

Canadian Agents: Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

A Safe Place for Tools

AND YOU WILL KNOW WHERE THEY ARE

Theftproof
Fireproof
Sanitary

DENNISTEEL
LONDON - CANADA
Lockers and Shelving

Material Locker
Style D22

Write Today for Prices

All Steel. Inside Dimensions 36" x 66" x 18"
Three-Point Locking Device. Yale Flat Lock
Finish Baked Enamel. Black, Green or Grey

Save the time lost looking for lost tools, etc. Also save the cost of replacing them.

THE DENNIS WIRE AND IRON WORKS CO. LIMITED
LONDON - - TORONTO

—laces a 6-inch Belt in THREE minutes

CLIPPER BELT LACER

Laces any width or thickness. You don't have to remove belt from shaft, as this small 19-lb. machine is carried to the belt and the work done on the floor.

Saves man-time, machine-time, and money, and you get a better joint.

Adapted to all makes of belting.
33,000 now in use all over the world.
Sent on 30 days' free trial.
Here's your opportunity to prove for yourself, or your own plant — that the "Clipper" is the **only** belt lacer you can afford to use.
FOR SALE BY ALL LEADING SUPPLY HOUSES IN CANADA.

Clipper Belt Lacer Company
1 Front Ave., Grand Rapids, Mich.

If any advertisement interests you, tear it out now and place with letters to be answered.

Marine

Port Arthur, Ont.—James Whalen, president and manager of the Western Drydock & Shipbuilding Co., of this city, states that he has secured contracts for two ocean-going freight steamers to be built here at once.

Catalogues

McKim Gaskets, is the title of Catalogue No. 16, issued by the McCord Mfg. Co., Detroit, Mich. The essential features of the McKim copper asbestos gaskets are described fully and dimensions and prices given for the various sizes The wide range of service is dealt with accompanied by illustrations showing a variety of joints where the gaskets are used.

Graphite Products. — The Joseph Dixon Crucible Co., Jersey City, N.J., are distributing a booklet entitled "Valuable Graphite Products," which deals with the company's well known and extensive line of graphite products. The class of work for which each product is intended is stated and its principal features dealt with fully. Price lists are included for the various lines.

F. Reddaway & Co., of Montreal, have issued a useful pocket diary and memorandum for 1916. Embodied in the diary proper are sectional maps of Canada and the United States. A lot of interesting general information is given in addition to the pages devoted to matter relating to the company's products such as "Camel Hair," and "Black Duck Belting," and "Reddaway" linen fire hose.

Recording Thermometers made by the Bristol Company, Waterbury Conn., are described and illustrated in catalogue No. 120. In addition to the matter dealing with the various types of thermometer are a number of specimen sections of the different sizes of charts for use with the thermometers. The catalogue also describes different styles of connecting tubes for various purposes and contains in the same section price lists for the various recording thermometers described in the preceding pages. A partial list of users of the "Bristol" recording thermometers is included.

Air Tools.—The Cleveland Pneumatic Tool Co., Cleveland, Ohio, has issued a new catalogue No. 12 describing an extensive line of air tools. The catalogue contains information of value for the selection of air tools also photographic illustrations of machines and appliances for every general and detailed purpose. Each type of tool is illustrated and is accompanied by a specification and table of capacity for the various sizes. Particulars of rivet sets and chisel shanks are included with dimensions for the various air tools with a list of parts for each.

Ball Bearings. — The Norma Co., of America, New York, have issued a catalogue No. 105 just off the press dealing with the "Norma" precision bearings. The catalogue contains 123 pages and endeavor has been made to present the subject in a way that will be interesting and helpful to engineers and also of some permanent text book value. The first 18 pages contain all the essential

facts about "Norma" roller and ball bearings covering the principal features embodied in their construction. The succeeding 20 pages deal with the principles of anti-friction efficiency as applied to "Norma" bearings covering the various types and explaining the facts in relation to bearing principles. Following the text matter comes 60 pages of tabular data giving the principal dimensions of the various types accompanied by diagrams and revealing the wide scope of the "Norma" line of bearings. Pages 102 to 115 contain a large variety of application drawings as suggestions for the draughtsman engineer while the concluding pages contain notes and suggestions on the selection of anti-friction bearings.

Book Review

The Testing of Machine Tools, by George W. Burley, 231 pages, 4¼ x 7⅛ in., 110 illustrations. Published by Scott, Greenwood & Son, London, England. Price $1 net. This publication is the eighteenth volume of the Broadway Series of Engineering Handbooks. The book deals with the various aspects of machine tool testing in such a way as to make the book suitable for engineer apprentices and students as well as responsible engineers. This subject has not heretofore been given the close consideration that its importance deserves, as a high degree of efficiency and accuracy is now demanded for modern machine tools. By the use of methods of testing the designer of machine tools is able to obtain the necessary data to enable him to produce a machine that will give the best possible results. The book contains eight chapters and an appendix. Chapter 1 covers the introduction and chapter 2 describes a number of tests on machine tool elements to determine their accuracy. Machine tool speed and feed tests are described in chapter 3, and mechanical efficiency tests in chapter 4. The next chapter deals with cutting force tests and the apparatus used while chapter 6 describes output and power consumption tests. Comparative tool testing is the subject of chapter 7, and commercial machine tool testing is described in the last chapter. The appendix covers one page and gives an inspector's report of lathe tests. The illustrations which are numerous show the different apparatus used for the various tests and also include a number of curves. The book is written in a comprehensive style and contains a considerable amount of useful information for students not easily obtained except through a medium such as this.

Jo precede pp. 121

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, FEBRUARY 10, 1916 No. 6

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President H. T. HUNTER, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY

PETER BAIN, M. E., Editor.

Associate Editors.

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

B. G. NEWTON - - - - - - Advertising Manager

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—London, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 140 So. Dearborn St., Room 607, Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Interesting Products of an Optical Factory Tool Room

Staff Article

The evolution of a successful thread-rolling machine for making very small screws such as are used in spectacleware was accompanied by many difficulties, the successful overcoming of which is testimony to the skill and resourcefulness displayed in its production. Machines of this nature, in various lines of manufacture, are sound evidence of the modern machinists' craft which has rendered so many discoveries of science available to the bulk of mankind.

THE wearing of glasses and spectacles has become such a regular part of the everyday life of many people that their interest in such articles does not extend beyond the act of purchasing them over a store counter. The moderate cost of optical goods combined with excellence of workmanship and material has been due largely to quantity production on special machinery. Other factors have also helped to develop the industry to its present state of efficiency, but to the modern tool designer and tool maker must be given a large share of the credit for producing goods of such remarkable excellence as are in daily use by so many people.

The present factory of the Consolidated Optical Co., Ltd., at 400 Richmond Street, west, Toronto, has been occupied by that company for several years, and the concentration which they have brought to bear on their product, has resulted in many interesting examples of the tool makers' and machine builders' art and skill. The manufacture of spectacleware forms a considerable portion of their business, and all of the special machinery used in this work has been designed and built by their own tool room staff.

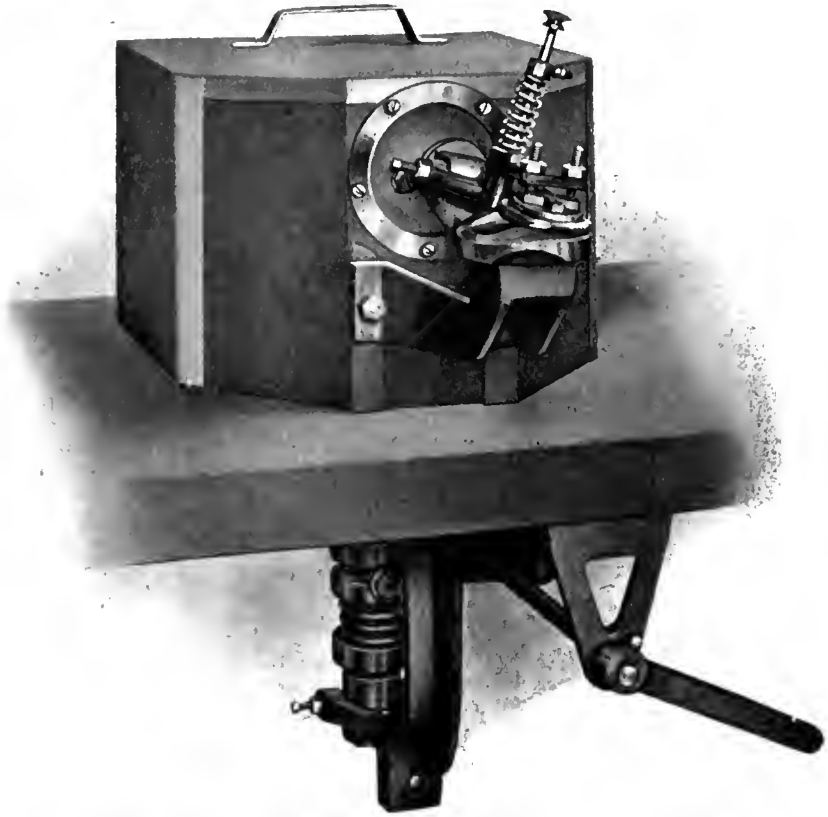


FIG. 2. LENS GRINDER MACHINE IN OPERATION ON TORIC LENS.

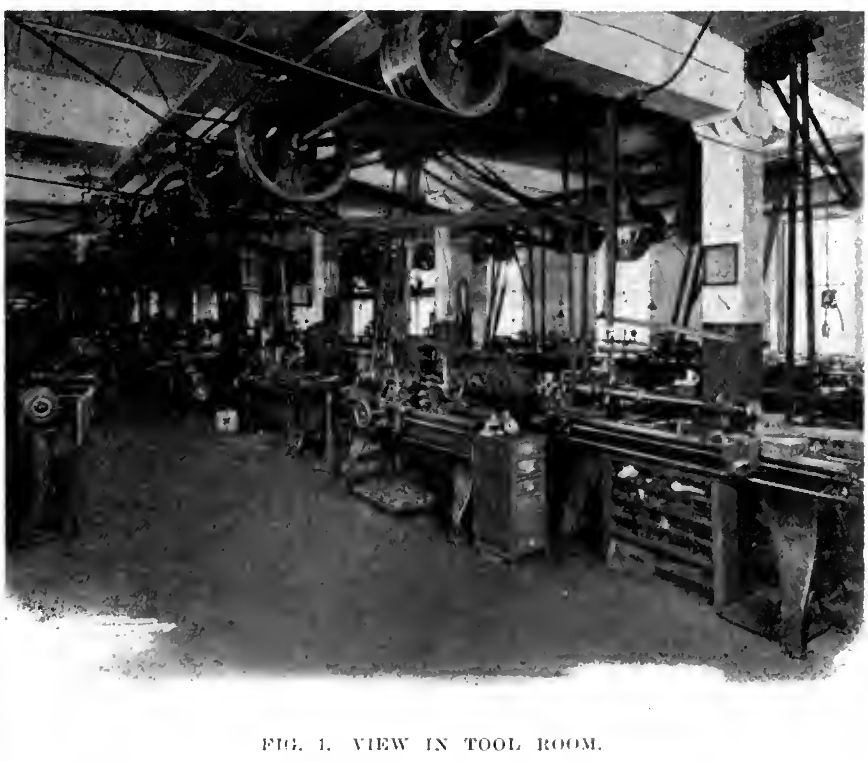


FIG. 1. VIEW IN TOOL ROOM.

A Lens Grinding Machine

The building of lens-grinding machinery for the trade calls for considerable work of an interesting nature, and illustrations Figs. 2, 3 and 4, show a machine which grinds toric and plano-cylindrical lenses quickly and accurately without expert knowledge or handling. Fig. 2 is a view of the machine mounted on the work bench with a lens in place on the top of the lapping block. Fig. 3 is a view of the interior from the back, with the casing removed, and Fig. 4 shows the construction of the clutch through which the driving belt operates the machine.

Referring to Fig. 2, the lap in use here is for a toric lens the surface of which is ovoid in form, that is to say, similar to an egg in which both ends are the same size. The lens is attached to a small crosspiece or chuck, in which are countersunk spots to receive the points of two small set screws. These set screws are carried in the front end

of a rod, the back end of which is hinged on rod E (Fig. 3), where it projects through the leather shield J. This hinge allows the front end of the lever to rise and fall as it is reciprocated across the lap block, the pointed ends of the set screws allowing the lens to adjust itself to the curve as it approaches the edge of the lap.

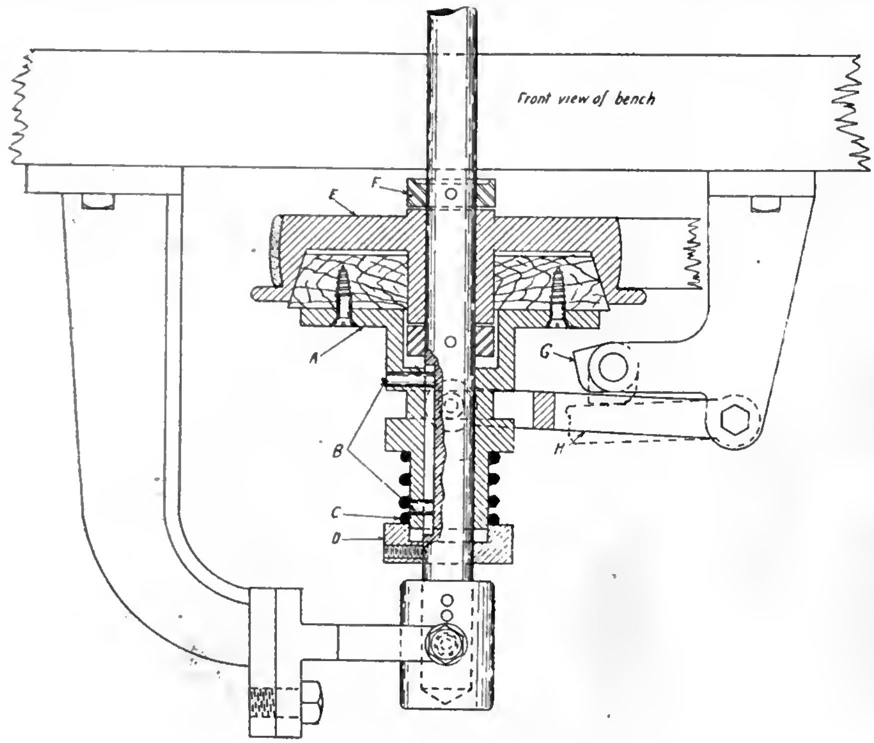


FIG. 4—DETAIL OF DRIVING CLUTCH

Nature of Movement

While this movement is taking place, the rod E, which imparts the motion, is being moved sideways so that the lens gradually works over the entire surface of the lap, from back to front, and side to side. The manner in which this is accomplished will be understood from Figs 2 and 3. The drive shaft A passes through the base plate and is supported in bearings formed in the two cross members. Immediately above the upper bearing is a small pinion B which meshes with the large gear H. Shaft A projects through pinion B, and carries a crank disc C, which, by means of connecting rod D, imparts a reciprocating motion to rod E which passes through leather dust shield J, as already mentioned. Rod E is carried in two bearings F, which form part of a frame which slides crosswise on rods G. The large gear H is connected by a rod I to the right hand end of this frame, thus moving it and rod E from side to side while crank disc C moves rod E back and forth. The connecting rod D is attached to rod E in such a way that the latter is free to revolve, thus allowing the mechanism on the other side of the shield to adjust itself to the curvature of the lap as it approaches the ends of its travel in either direction.

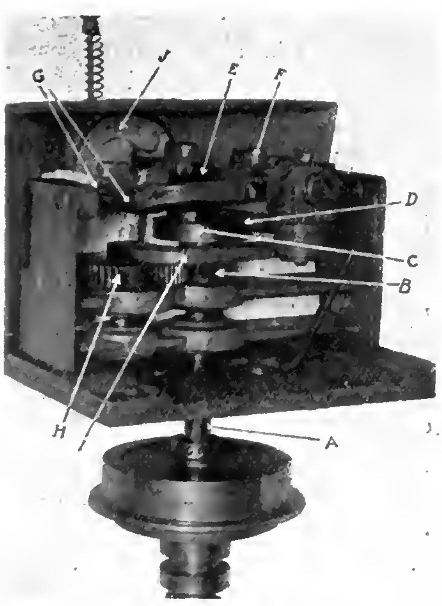


FIG. 3—MECHANISM OF LENS GRINDING MACHINE

The gear ratio between pinion B and gear H is such that a hunting tooth occurs, thus preventing the lens from passing over the same portion of the lap except at long intervals, avoiding any possibility of grooving.

The pressure on the lens is controlled by a tension screw which exerts its pressure exactly in the centre of the lens. This tension can be varied by raising or lowering the thumb screw.

A Simple Clutch

The clutch, Fig. 4, is of simple and efficient construction, and is so designed that all stresses are self-contained when engaged. Clutch sleeve A slides on the vertical shaft which it drives through pins B working in a keyway. On the lower end of this sleeve is a coil spring C, one end resting on collar D, while the other end forces the sleeve A upward so that the wooden cone is forced into belt-driven pulley E, which thereby imparts motion to the whole arrangement. Upward movement of pulley E is prevented by collar F, while a similar collar below, holds up the pulley while the clutch is being pulled out by cam G acting on lever H. When the clutch is disengaged the spring C is compressed against collar D but as the motion ceases right away there are no parts in motion while under stress.

Making Laps for Lenses

The general run of optical work calls for the production of lens surfaces of various forms, chief of which are plano or flat, cylindrical, spherical, and toric,

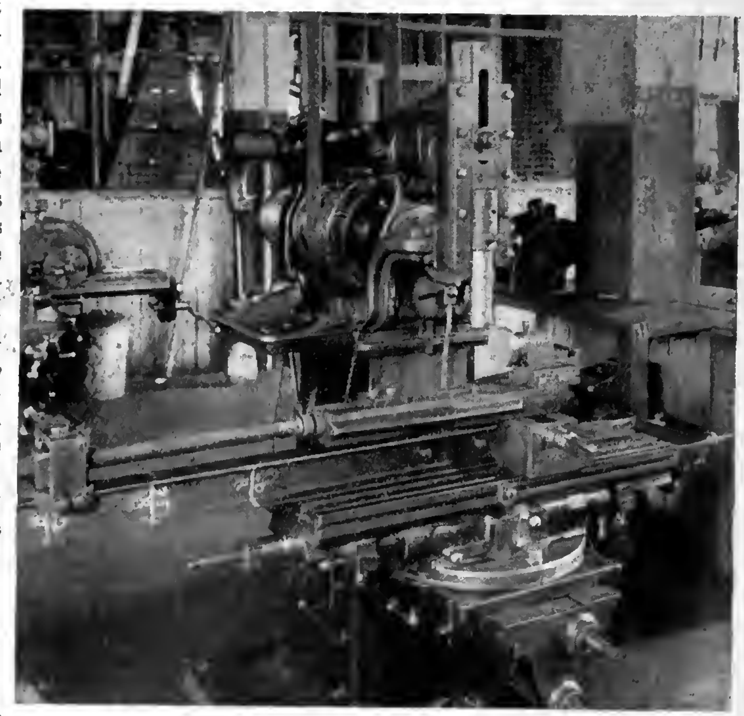


FIG. 5—VIEW OF MILLING MACHINE WITH SLOTTING ATTACHMENT FOR CUTTING CYLINDRICAL LAPS

various combinations of these being used as required. The necessary laps for forming these surfaces have to be accurately machined and the method used

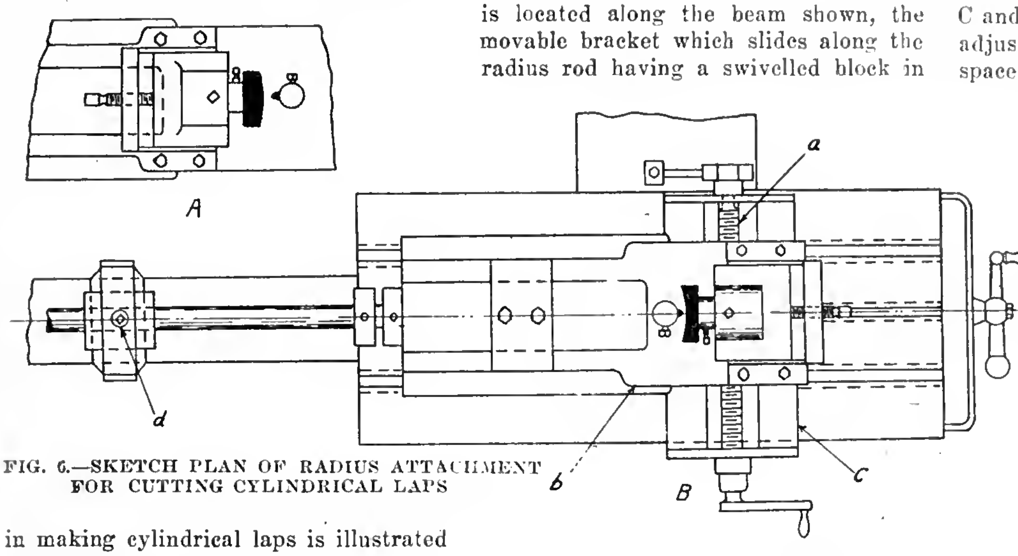


FIG. 6.—SKETCH PLAN OF RADIUS ATTACHMENT FOR CUTTING CYLINDRICAL LAPS

in making cylindrical laps is illustrated in Figs. 5 and 6. Sketches of concave and convex cylindrical laps are shown at A and B respectively. Fig. 7.

The faces of these laps are straight in one direction and curved in the cross direction, the radius of the curve being made according to the length of focus required. A milling machine fitted with a substantial slotting attachment, Fig. 5, and having a radial movement for the work table, produces laps of any desired radius either concave or convex. The ram slides in a guide bracket, the upper end of which is clamped on the supporting arm and the lower end bolted to the sides of the main frame.

A crank disc is mounted on the nose of the spindle from which a connecting rod goes to the top end of the ram. The slot in the top of the ram allows for varying the location of the stroke. Back of the crank disc is a couple of gears, one of which is on the spindle while the other, which can be observed in the photograph is provided with a slot

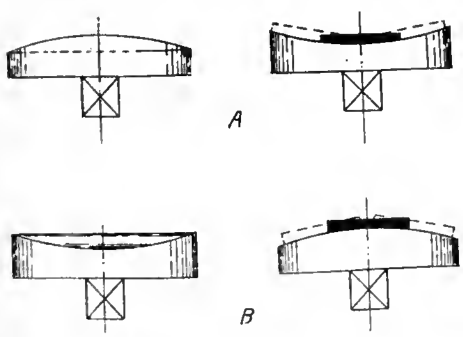


FIG. 7—CONCAVE AND CONVEX CYLINDRICAL LAPS

which carries an adjustable crank pin. This crank pin is connected by a rod to a ratchet on the back end of feed screw (a) which moves the radial slide (b) across block (c). This block is secured to the main work table, and the nut on screw (a) is so connected to slide (b) that the latter can swing through an arc with point (d) as the centre. Point (d) is located along the beam shown, the movable bracket which slides along the radius rod having a swivelled block in which the radius rod is fixed. The photograph shows a concave lap just completed.

When machining convex laps, the work chuck is reversed so as to be between the cutting tool and the point (d). Fig. 6 shows a plan of the arrangement, in which convex laps are being cut at A and concave laps at B. The production of spherical laps is similar in principle to ball turning and is done on a specially fitted engine lathe.

Rolling Threads on Small Screws

The production of small screws used in assembling spectacle parts is one of the most interesting pieces of work to be observed here. These screws are $\frac{1}{4}$ in. long overall x .047 in. dia., with ninety threads per inch, and have to be perfect in finish and accurate in size. In order to produce these in quantities and at reasonable cost, a thread rolling machine has been developed which takes the screw blanks in bulk from the automatics, and feeds them, rolls the thread and delivers them through a spout without any attention whatever from the operator beyond shovelling in blank screws.

Photographs of this machine are reproduced in Figs. 8 and 9, and constructional details are shown in Figs. 10, 11 and 12. Reference letters on the various views correspond:—A, feed hopper; B, feed chute; C, threading roll; D felt pad; E, delivery chute; F, feed plunger; G, feed lever; H, feed cam; I, threading die. By means of the mechanism illustrated, the screw blanks are fed in at suitable intervals between threading roll C and die-block I, the two surfaces being adjusted to such a distance, that the space between the top of the threads of the roll and the block is equal to the diameter of the screw at the bottom of the thread.

The vertical spindle on the upper end of which the die roll is mounted, is supported in two tapered bushes and carries a bevel gear meshing with a pinion on the end of the main drive shaft, which in turn is driven through worm gear from the grooved belt pulley shown. A clutch is provided on the main drive shaft so that the worm gear may be disengaged, and the machine revolved by hand when adjustments are being made.

When the machine is in operation, feed hopper A is filled with blank screws which are lifted one at a time by feed plunger F. The two extreme positions of this plunger are shown in Fig. 11, from which it will be seen that the plunger with its sleeve sinks down to the bottom of the hopper, allowing the mass of blanks to close over it. As it rises up, the blanks roll off with the exception of one which is held in the recess formed by the extension of the sleeve above the end of the plunger. The upward movement continues till the lower end of the sleeve reaches its limit of travel when the plunger continues to the end of its stroke, compressing the spring, and extending the point beyond the end of the sleeve. The point is sloped and grooved as shown so that the blank screw slides off on to the feed chute B. A small hammer at the side of

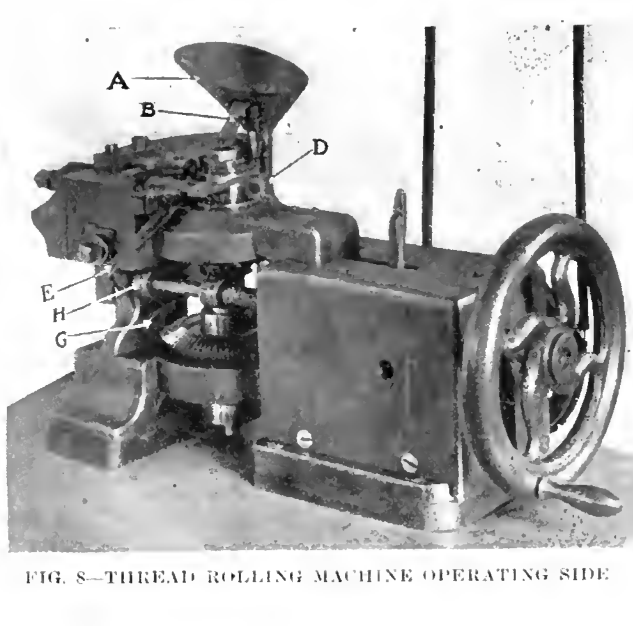


FIG. 8—THREAD ROLLING MACHINE OPERATING SIDE

the hopper, Fig. 11, taps the chute gently, so that the blank screw moves forward from the edge until it reaches a slot which allows the body of the blank to fall through, leaving it suspended by the head, see Fig. 11. The blanks pass down the chute, by gravity till they reach the roll.

Although the roll is revolving continually, the screw blanks must not enter except at certain points when the thread on the roll is immediately opposite the thread on the die, otherwise the thread rolled on the screw would be entirely distorted. The proportions of the roll are such that at four points on its periphery the thread matches the thread on the die block I. Fig. 12 shows the mechanism controlling this intermittent feed. The lever L is free on the roll spindle, but is held back in position shown by a spring. Part of this lever overhangs the face of the roll forming the finger K. The pawl N is swiveled on top of this finger and has one end shaped to suit the cam faces of M, while the other end is shaped to contact with roll O. Cam M is fixed to the main spindle in a definite relation to the thread.

The blanks, having reached the end of the chute, are held back by retaining plunger J, until cam M engages pawl N. When this happens, lever L is revolved so that finger K presses the first blank against plunger J, forcing it back and carrying the blank forward till it engages between the roll and the die. By this time, pawl N is tripped by the roll O, and lever L with finger K and pawl N is returned to its position as shown in Fig. 12. Plunger J springs forward as finger K passes back, and holds the next blank in position for the next movement of the mechanism.

The surface of the die block I is set to gradually approach roll C, so that

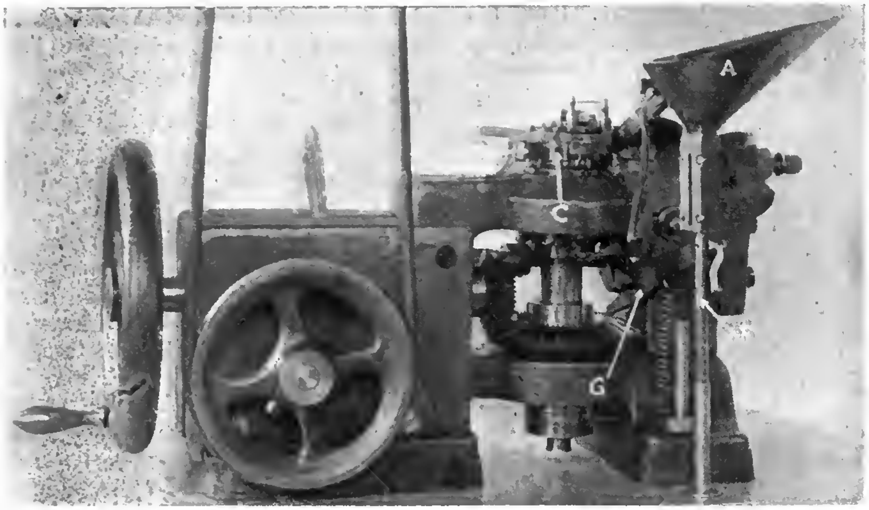


FIG. 9—REAR VIEW SHOWING FEED MECHANISM

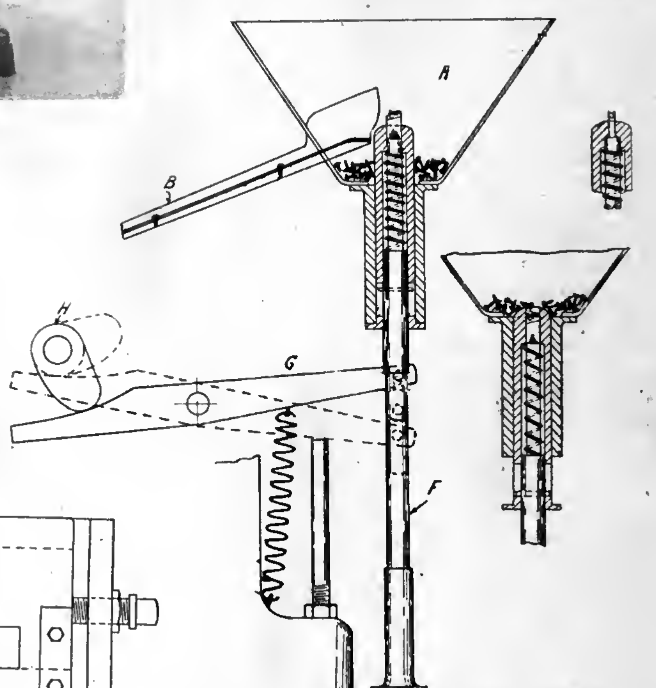


FIG. 11—DETAIL OF HOPPER FEED

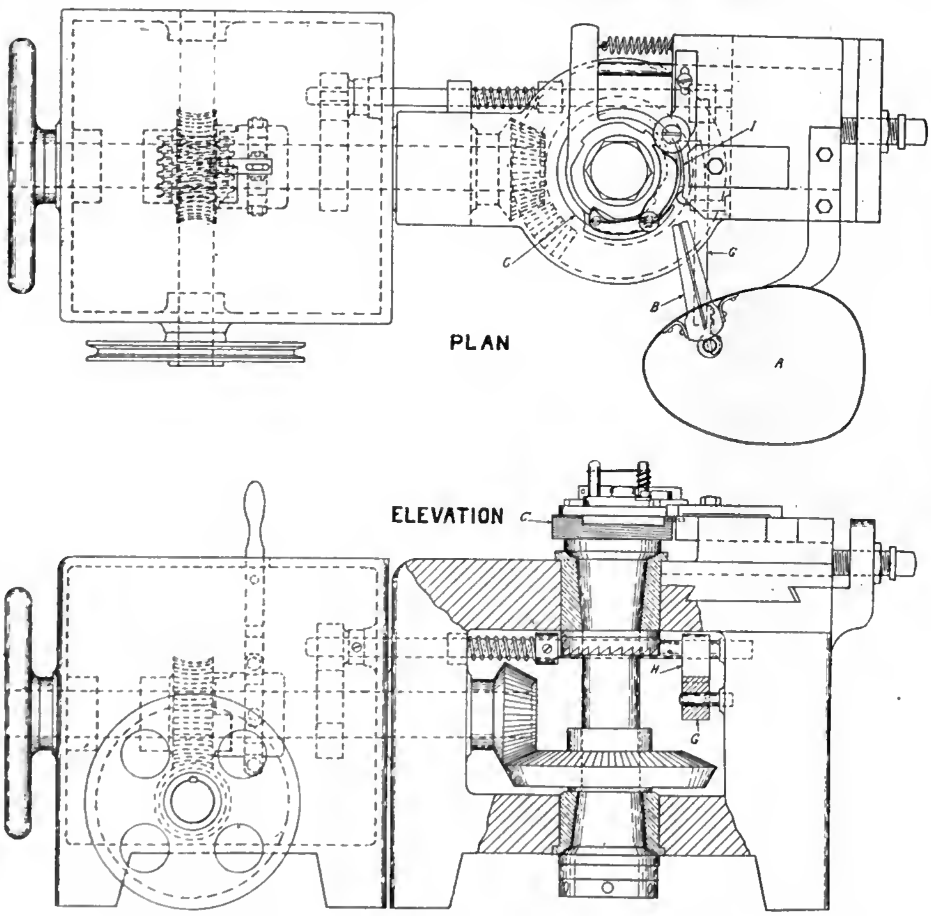


FIG. 10—GENERAL ARRANGEMENT OF THREAD ROLLING MACHINE

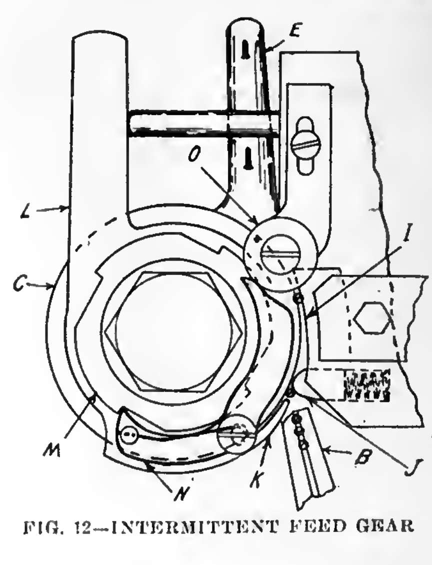


FIG. 12—INTERMITTENT FEED GEAR

the thread is gradually pressed into shape. The thread on the roll is made left hand, and the die is right hand. The setting and adjusting of the parts calls

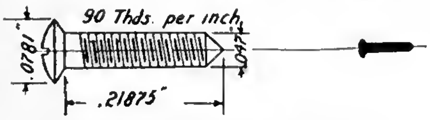


FIG. 13—LEFT, ENLARGED VIEW. RIGHT, ACTUAL SIZE OF SCREW.

for great accuracy and full provision has been made for this in the design. Fig. 15 gives the actual dimensions of the screw on an enlarged scale, the actual size of screw being shown in solid black.

LAWN MOWER ADJUSTMENT, SHARPENING AND REPAIR

By James R. Tate

MORE money is often made out of small jobs properly handled than is made out of many of the difficult and particular jobs which come into the regular repair shop. It is a fact that there are men making more money out of the manufacture of collar buttons than other men are making from the manufacture of locomotives.

Some time ago I was managing a manufacturing business. We had a very complete plant, and could handle almost any ordinary repair work as a side line. I was surprised to learn that per hour we really made more money out of sharpening lawn mowers and plow shares than we made from the manufacture of the article to which we were devoting almost all our energy. If it were possible to keep fifty men going steadily sharpening lawn mowers at fifty cents each, there would be no better business of its size in America.

However, we cannot keep fifty men going, but in many localities a good big boy or a man can be kept busy on this work. Like almost anything else, there is a right and a wrong way of doing it. If the system as follows is adopted, there is no reason why a man should not sharpen four mowers per hour. If repairs are required they must be charged for accordingly.

Lawn Mower Cutting Troubles

There are usually three causes for a lawn mower not cutting. Sometimes it is one, sometimes two and sometimes all three. On starting to locate the trouble or to sharpen a mower, the first move is to see if the shaft to the revolving knives is held snugly by the bearings. After you have fixed a few mowers you will be able to tell one with a loose shaft, even when passing a lawn where an attempt is being made to cut grass. You will hear the knives clatter and strike the knife bar. Sometimes it will cut, and sometimes it will miss doing so for two or three revolutions. We must, therefore first see to it that this shaft is held snugly. This can be done by taking the end of frame and giving it an up and down shaking motion. Should it be loose, a screw-driver will adjust the bearing to the proper place; use the screw-driver with one hand and determine the proper tension with the other. Some mowers have ball bearings, and with them it is an easy matter to tighten up the bearings. Simply turn collar with the prong of a file and take up the slack with the set screw provided for that purpose.

Being sure the shaft is held snugly by the bearings, the knife bar must be brought up so that it only touches the revolving blades. This is done by simply loosening the forward screw and running the hind one down. You will notice the bar tilt toward the blades. The common mistake here is that of bringing the knife bar up so that the revolving blades cannot possibly turn, therefore bring the knife bar up until it touches very lightly on the revolving blades.

In order to cause the mower to run backwards, the small rachet pinions are changed from one end to the other, and the mower turned upside down. The revolving knives will then turn the wrong way. The method of grinding the blades is such that they will each touch to their full length.

The emery used should be of about the same grain as table salt, powdered emery or flour-of-emery is too fine and will take too long to cut the blades down. Having procured emery as stated, spread a layer of it along knife bar and keep mower in such a position that when oil is applied, it will naturally run down the knife bar towards the cutting edge, thus carrying the emery with it, and supplying same to complete the grinding as the mower is pushed along.

After running the mower for, say, 300 feet, stop and apply more emery and oil and if necessary tighten up the knife bar a little more. Continue this process of grinding until all the revolving knives touch evenly to their full length on the knife bar, occasionally trying the bearings to see that they are not coming loose again.

When the grinding is completed, change the small pinions back to their proper sides, run the mower through some grass, when the results will be found satisfactory.

LICENSES TO IMPORT WAR MATERIALS

The British Minister of Munitions gives notice that all persons who desire to import from France, Italy or Russia materials required in connection with the manufacture of munitions of war, being materials of which the export from the country in question is prohibited or restricted, should submit their applications to the Director-General of Munitions Supply, B.M. 3, Armament Buildings, Whitehall Place, S.W. The application must contain:

(a)—A precise description of the nature and quantity of the goods which it is desired to import.

(b)—A statement of the use to which they are to be put, and any evidence, such as references to direct or indirect Government contracts, tending to show that they are required for the manufacture of munitions of war.

(c)—The name of the firm or firms to whom they are to be consigned, as well as that of the firm or firms on whose behalf they are purchased. The Minister of Munitions will then, in approved cases, take all the necessary steps with a view to obtaining from the Government concerned a license to export the goods in question.

British Controlled Factories. — The British Minister of Munitions announces that he has made an order under Section 4 of the Munitions of War Act, 1915, declaring 396 additional factories as controlled establishments under the Act, as from January 1st, 1916. A total of 2,422 establishments have now been declared as controlled under the Act, from the date of the first order, July 12th, 1915, to January 1st, 1916, inclusive.

Crank Shaft Failures.—The investigation of crank shaft failures is rendered difficult owing to complications which may be introduced by their being out of line and by the stresses set up when the bearings are drenched with water for the purposes of cooling after overheating. From the study of a large number of failures which have occurred in practice, Mr. C. E. Stromeyer concludes that when crank shafts are subjected to pure alternating stresses their endurances can be estimated if the fatigue properties of the material are known. Modern crank shafts should be much stronger than old ones owing to the substitution of steel for wrought iron. Apparently small fillets have a material weakening effect on crank shafts, and it appears probable that crank shafts showing a tendency to crack in service might be improved by increasing the size of the fillets.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

COMBINING PARTS FOR PRODUCTIVE MANUFACTURE

by F. Scriber

MULTIPLE manufacture has brought out a great many ingenious methods of holding work with the object of putting as many

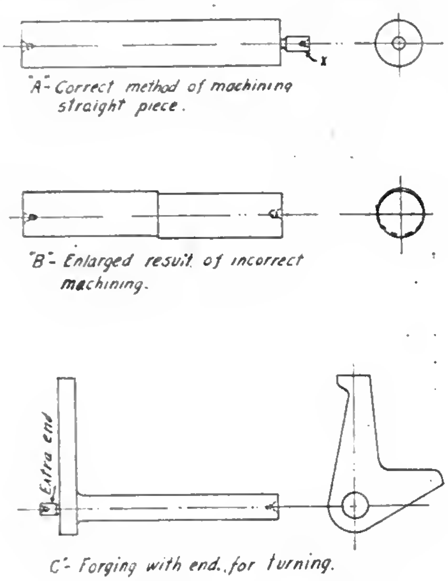


FIG. 1. METHODS OF STRAIGHT TURNING.

cutting tools to work on a part at one time as possible. This practice of course saves time in handling and often produces a better class of work by cutting down the responsibilities of the operator.

While this article will show tools for handling the work described the principal object is to forcibly bring out the

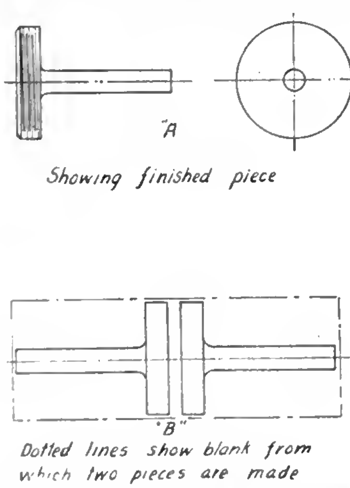


FIG. 2. MACHINING TWO PIECES IN COMBINED FORM.

advantages to be derived from combining parts and machining them together. Sometimes this is best done by combining parts of the same kind and then again, parts entirely foreign to each other may be effectively combined.

Useful Suggestions

Referring to Fig. 1 a few conveniences are shown which materially aid a workman, the first of which, A, is the practice of leaving a rod long enough so that the centre may be cut off after

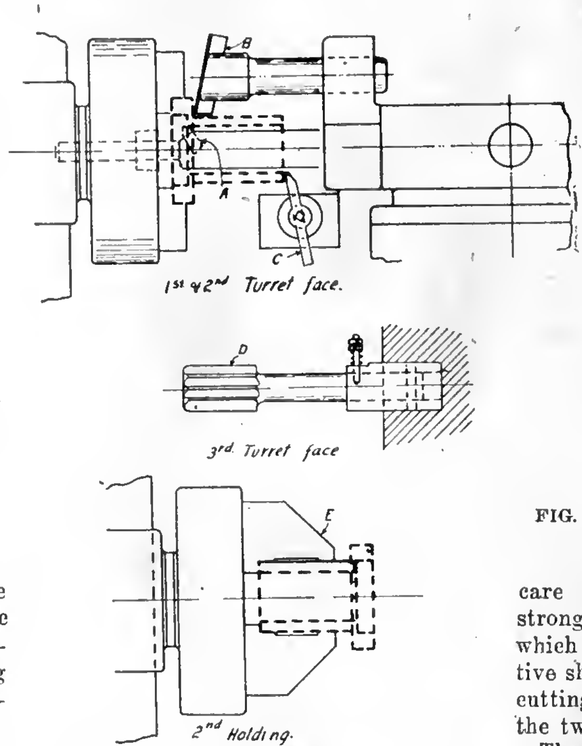


FIG. 4. METHOD OF MACHINING COMBINED BUSHINGS SHOWN IN FIG. 3.

grinding. By this method it will not be necessary to turn the rod around when partly ground, as the portion X with the centre, may be used for dogging and the grinding wheel may be run across the entire surface. At B the same bar is shown in its probable condition when ground by reversing the dog and grinding from each end to the centre only. The last example C, is a forging with a centre which is to be cut off after the shank is turned.

A simple method of combined turning is shown in Fig. 2. It may be seen that the part illustrated consists of a shank with a short threaded portion, the latter being too short to conveniently hold a dog. In order to overcome this difficulty, two parts were turned in combined form as shown at B. The piece to be machined. is driven from one end and the large diameter and shank rough turned. It is then reversed and the shank on the opposite end turned to the rough diameter, leaving the portion to be threaded in the centre. A cutting-off tool is next used to separate the two pieces, it being fed in to a suitable depth,

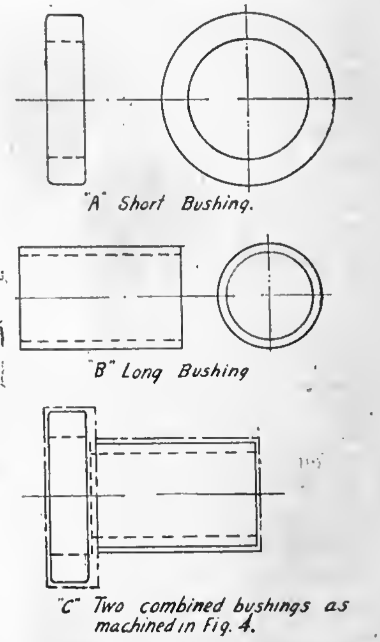


FIG. 3. COMBINATION CASTINGS FOR MACHINING.

care being taken to leave the work strong enough for the next operations, which include finishing the two respective shanks and threads. After this, the cutting-off tool is again inserted and the two pieces are separated.

The principal advantage in handling two parts together in this case is the

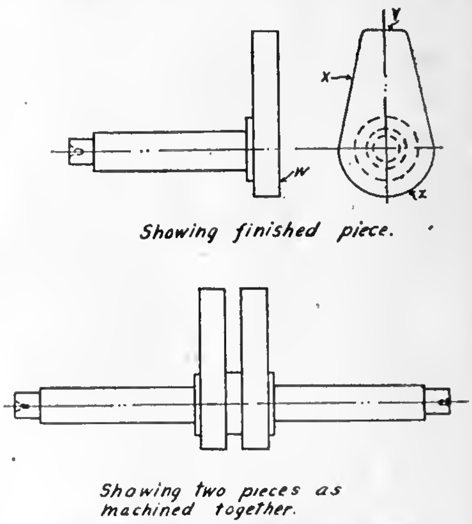


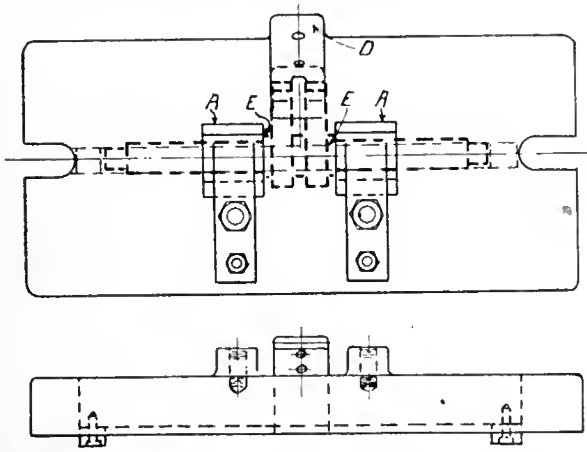
FIG. 5. PARTS COMBINED FOR CONVENIENCE IN MILLING.

convenience in driving as the short thread when dogged on would seriously interfere with turning the shank if

machined separately. This method is quite often used for making special screws with short heads.

Combination Castings

The manufacture of various castings often furnishes examples which warrant consideration as shown by the bronze casting Fig. 3. This is a combination of two bushings, the short bushing A, and the long bushing B, and as it would mean two operations on each piece if handled separately the two are combined as at C. The casting is gripped in a chuck by the large diameter and machined on a turret lathe with the tools arranged as shown in Fig. 4. The small bushing is first rough and finish-bored, turned, faced and reamed by means of the respective tools, A, B, and C; and the floating reamer D, which is attached to the third turret face. It is next gripped in a soft-jawed chuck E, by the finished diameter, and the larger end is similarly machined, the tools for this operation being practically the same as used in the previous operation. In the last operation a cutting-off tool is used and the casting cut in two parts thus making the bushings.



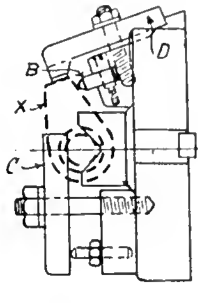


FIG. 6. FIXTURE FOR MILLING SIDE "X" ON PART SHOWN BY FIG. 5.

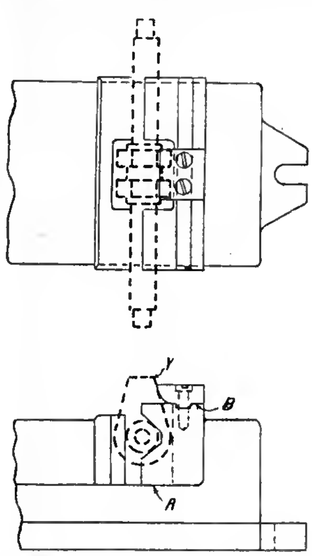


FIG. 7. VISE JAWS FOR HOLDING WORK WHILE MILLING END "Y."

Milling Duplicate Parts

Parts to be milled are often handled more satisfactorily by combining them and Fig. 5 is an example of this type of work. As is obvious from the illustration the two parts are combined, while the ends or shanks are turned in a lathe in much the same manner as described in Fig. 2, following which they are gripped in the fixture, Fig. 6, and the side X is milled. This is accomplished by locating the work in two vee blocks A, and against the equalizing block B. By clamping the part with straps C, the work is securely located while as an additional precaution against the strain of the cut a strap D is used to clamp over the ends of the forging. In this fixture the location endways is taken care of by the face E against the ends of the vee blocks. To mill the opposite edge a similar fixture is employed, the work being simply turned end for end and instead of the equalizing block a solid locating block is used for the obvious reason that the edges located from are finished and will come alike in each case.

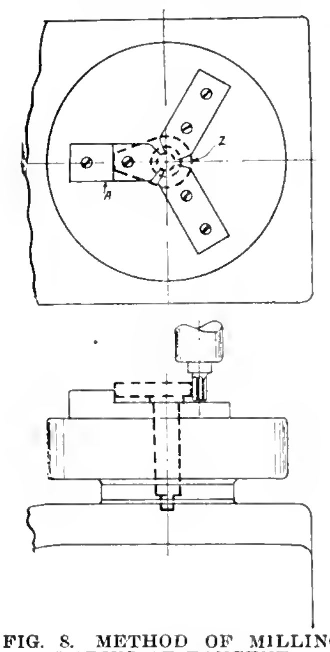


FIG. 8. METHOD OF MILLING RADIUS AT TANGENT TO SIDES.

To mill the end Y, Fig. 5, the work is gripped in vise jaws, Fig. 7, and is located in the vee jaw A, and is held by the plain jaw opposite; the block B is used for squaring up. In addition to the convenience of handling two parts as one in this particular instance there is the additional advantage of milling two pieces in the time otherwise required for milling one. The two pieces thus machined are now cut apart for the final operations, which include machining the radius Z, as shown by Fig. 8. Briefly stated, the work is gripped in a chuck on the dividing head of a milling machine, and with an end mill in vertical spindle the radius is machined by revolving the index head with the machine table locked the correct distance from the centre of the milling spindle. For locating the work in the chuck a special stepped jaw A is used. The final operation on this piece is to mill the end W, which is done by holding the work in a chuck, as in Fig. 8, and using a surface mill in the spindle while the table is fed under the cutter in the usual manner.

ROUGHING AND FINISHING WITH SAME GRINDING WHEEL

By C. W. Blakeslee

A FEW years back, and in many cases even at the present time, the general impression is that to obtain a fine finish it becomes necessary to use a fine grain wheel. This practice and belief, however, is practically done away with. demonstrating the rapid and improved methods employed by the wheel manufacturers who have educated the users of wheels that the desired finish on a piece of work can be had through the changes of work and wheel speeds, together with the traverse of the grinding-machine bed. In a great majority of cases roughing and finishing can be accomplished with the same wheel through the many change feeds provided on the modern cylindrical grinding machine.

Often where a satisfactory wheel is furnished to conform to a set feed, the changing of the work speed will change the action of the wheel in such a decided manner as to render it worthless for the work it was intended. It is also true that many times where a wheel is apparently unsuitable for a certain class of work, through the manipulation of change feeds and wheel speeds, very satisfactory results may be brought about.

F. T. Leversuch, general manager of the London & Port Stanley Railway, has resigned.

Processes of Manufacturing Seamless Steel Tubes*

By J. J. Dunn **

Since the beginning of the use of metal tubes, a long list of inventors has sought a means of eliminating the inherent weakness of a joint. The search goes on still, for, as yet no method of making seamless tubes can compete in cost of manufacture with methods of producing seamed tubes. In spite of this handicap, the use of seamless tubes has increased rapidly on account of certain advantages due to their peculiar method of production.

As it seems probable that the cost of seamless tubes will gradually approach the cost of welded tubes, and each improvement made will open up a wider field for their use, it will doubtless be of general interest to describe the various processes employed for making seamless tubes of steel. It is as important to understand the advantages and limitations of the seamless tube as it is of any other engineering material; for indiscriminate use of this material tends to discourage its use in those places where by its character it is fitted to give economical service. The advantages of the seamless tube are almost self evident, but its limitations are most surely comprehended only when the manufacturing methods employed in its making are clearly understood.

Seamless tubes are made to-day by two general processes; the piercing process and the cupping process. As the piercing process is used for by far the larger portion of seamless products it will be first described. The cupping process will be but briefly referred to.

There are two general methods of piercing, first rotary piercing, and second, punching. The punching method is used for special classes of work, but it is the rotary piercing process that produces the larger tonnage and is the most widely used. The possibility of rotary piercing was discovered by Mannesman, who devised practically all of the many combinations of rolls that have been successfully used. There is, however, one notable exception which is the arrangement proposed and used by R. C. Stiefel.

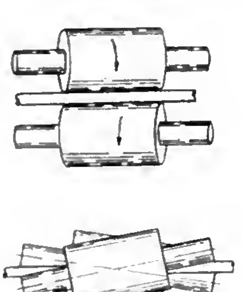


FIG. 1.

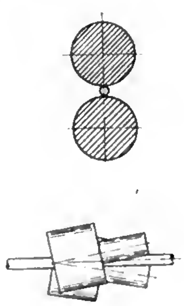


FIG. 2.

Rotary Piercing

The essential features of a machine for rotary piercing are revolving surfaces so arranged that their contact with the cylindrical piece of metal which is to be pierced will impart to it a simultaneous motion of rotation and translation; and a mandrel for controlling the flow of the metal. To accomplish this it is sufficient that the axes of the rolls and of the cylinder of metal be neither parallel nor intersecting lines. Practically the departure from the condition of parallel or intersecting axes must be wide enough to overcome the frictional resistance to motion in translation and not so wide as to prevent rotation.

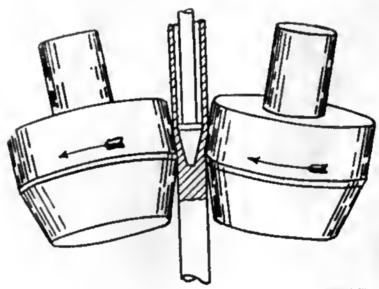


FIG. 4.

Figure 1 shows in elevation and plan, cylindrical rolls which will impart the desired motion to a cylindrical blank between the rolls and in contact with them. Figure 2 is an elevation and plan of sections of the rolls by planes at right angles to the axes of the rolls and makes clear how the rolls impart the two motions to the blank between them. These rolls are not a suitable arrangement for piercing as they can have only a small area of contact with the blank unless it be greatly deformed.

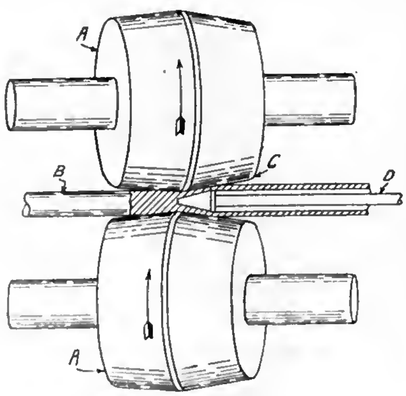
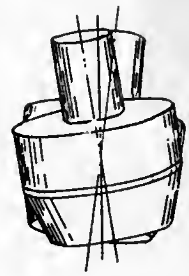


FIG. 3.

Figure 3 shows a practicable arrangement. In this figure the solid blank B, is shown between the rolls and partly pierced. The piercing mandrel C, is in its working position supported by a bar D. The rolls A, are truncated cones so proportioned as to properly distribute the work of reducing the metal of the solid blank as it passes over the piercing mandrel and is formed into a tubular section.



Roll Operation.

In operation the rolls are adjusted to the proper distance apart and the mandrel is placed in position. The rolls being in motion, the heated blank is pushed into the entrance angle and coming in contact with the rolls, takes motion from them of rotation and longitudinal travel. The first work of the rolls is to reduce the diameter of the blank giving it a conical form and increasing its contact with the rolls as it encounters the piercing mandrel. Then the reduction of cross sectional area of the blank takes place very rapidly as it passes over the mandrel. The diverging angle of the exit side of the rolls permits equalizing the work along the length of the mandrel and also gives room for the expansion in diameter that is an effect of the rolling contact. Further it permits of such a relation of the surfaces of the rolls and the mandrel as to produce a comparatively smooth pierced billet.

It must be evident that the angles of entrance and exit passes of the rolls; the diameter and angles of the mandrel; the relation of the position of the mandrel to the roll passes; the diameter of the blank; and the distance between the rolls influence profoundly the size and character of the tube produced. Besides these factors, the heat of the metal being worked; the speed of the rolls; the relative rate of longitudinal travel to rotation, all have a decided effect. Indeed, it is only within the last 10 years that the relations of these various factors were well enough understood to

*From a paper read recently before the Canadian Railway Club, Montreal.

**General Superintendent, Shelby Steel Tube Co., Pittsburg, Pa.

permit of producing a given size tube without a trial and error adjustment of the machine.

The divergence from the desired result occurred in the diameter and wall thickness of the hollow billet produced; in the concentricity of the bore and in unnecessary working of the metal. In the efforts made to minimize these variations many designs of piercing machines were worked out and not a few of them were actually constructed.

Figures 4 and 5 show variations made from the type of roll shown in Figure 3, by changing the angles of the roll axes. All sorts of angles were tried, from axes in planes parallel to the axes of the blank to axes in planes at angles of 85° to that axis. Also with all these variations was combined a travel of the billet in the reverse direction to that shown in the figures together with a wide range of entrance and exit angles, as well as variations in the shape of the piercing mandrel. Practically all these various arrangements will pierce a solid blank and with each type of machine there is a combination of roll or disc diameter, entrance and exit angles, mandrel angles and feed which will produce good work on at least a limited range of sizes.

Minimum Displacement of Metal Requirement

One of the most important requirements in a piercing machine is that the tube be formed with a minimum displacement of metal. Looking again at Figures 3, 4 and 5, it is evident that the rolls tend to impart different speeds of rotation to the blank at different points of contact along the axis of the blank. This results in a twisting of the tubes as the piercing proceeds, so that a line on the surface of the solid blank, parallel to its axfiis becomes a helixfi on the surface of the tube. One of the earlier patents claimed this feature as an advantage on the assumption that a tube is usually subjected to a greater stress circumferentially than longitudinally, but practically it has been found that this unnecessary displacement of material tended to rupture the metal in the piercing operation should there exist any defect in the solid blank.

A line on the surface of the solid blank, parallel to its axis becomes a helix on the surface of the tube. One of the earlier patents claimed this feature as an advantage on the assumption that a tube is usually subjected to a greater stress circumferentially than longitudinally, but practically it has been found that this unnecessary displacement of material tended to rupture the metal in the piercing operation should there exist any defect in the solid blank.

R. C. Stiefel designed and patented a type of piercing machine which reduced this twisting of the metal in regular practice to such an extent that the helix was right or left hand depending upon the setting of the discs

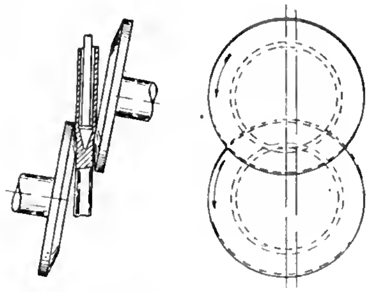


FIG. 6.

and mandrel position. Mr. Stiefel's arrangement is shown in Figure 6. From the figure it is seen that at any cross section of the blank the sum of the radii of the circles of the discs that impart rotation to the blank is exactly equal to the sum of the radii at any other section; hence, except as the motion is modified by the action of the piercing mandrel, the blank, solid or pierced, is revolving at a uniform rate at every section.

It will be noticed that there is a very considerable slip between the billet and the discs, varying from zero at a point midway between the disc axes to a maximum at the points where contact between discs and blank ceases. This slip has no very important influence on the work. However, it causes a waste of power, a disadvantage that is more than

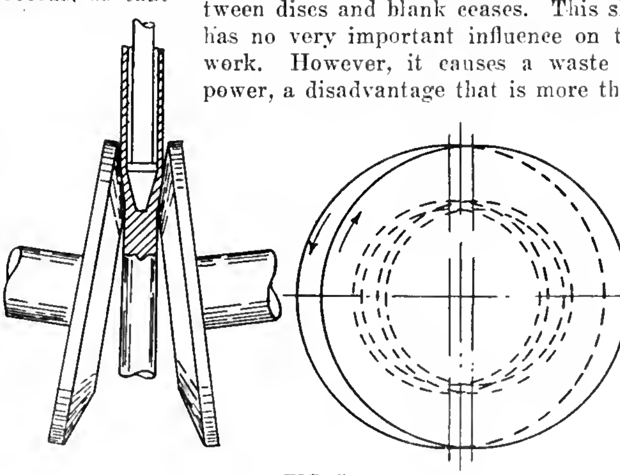


FIG. 5.

offset by the other good features of the design.

These points of the rotary piercing operation have been dwelt on at some length, as it is this operation alone that is peculiar to the making of seamless tubes and an understanding of the numerous factors that modify the results is necessary to an understanding of succeeding operations and to resulting variations in the finished product.

The Erhardt Punching Process

For certain classes of work a process of piercing is used that consists of simply punching the hole in the solid blank. This method is generally known as the Erhardt process. A heated blank, preferably square in section, is placed in a die somewhat longer than the blank end of a diameter corresponding to the

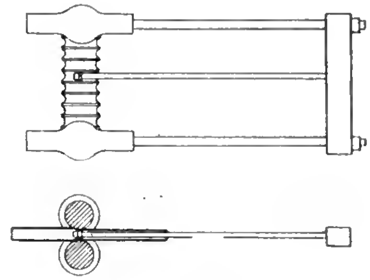


FIG. 7.

desired diameter of the blank after piercing. Thus confined to prevent lateral flow of the metal, a punch of desired size is forced into the blank, displacing it laterally to the limit of the die after which the metal flows along the punch as it penetrates to the bottom of the blank. Usually this method is confined to the production of tubes with one end closed and integral with the tube. It is economical only for the larger diameters and comparatively short lengths.

Cupping Process

A third method of making seamless tubes is that called the cupping process. In this method the raw material is in the form of a plate. The first operation is to trim the plate to a circle by which at the very beginning a loss in scrap of 25% occurs. After trimming, the plate while hot is pushed through a circular die and formed into a cup approximately hemispherical in section. Successive passes through dies of decreasing diameters elongates the cup into a tube with one end closed. The economical application of the cupping process is to tubes of large diameters and heavy wall. The only limit seems to be the size of the presses required for the work. Tubes of 24 inches in diameter or even larger, weighing 6000 pounds each, can be produced on existing equipment.

The blank after piercing varies so greatly in dimensions of both the diameter and wall thickness that additional operations are required to bring it within the variations required by most uses. For many purposes the required accuracy can be attained by a hot operation. but for others requiring still closer limits resort is had to cold working. Succeeding operations are required for

production of sizes which cannot be accomplished by piercing alone.

Many schemes have been devised for the hot finishing of the pierced tube, rolling on long solid mandrels in various ways, extracting the mandrel after the operation; drawing through dies and over long mandrels, and rolling on short mandrels have all been thoroughly tried out more or less successfully, but it is rolling on a short mandrel that has had the widest application, on account of the accuracy of the product and the comparatively low cost of the operation. Figure 7 shows diagramatically a machine for this method.

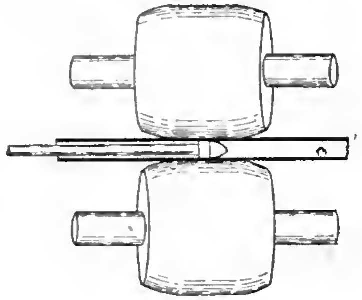


FIG. 8.

A stand of two high rolls with circular grooves is used. A short mandrel is supported in the groove of the rolls by a long mandrel abutted against a yoke which is tied by long rods to the roll housing. In operation the pierced billet at a proper temperature is presented to the rolls which seize it and force it through the groove and over the mandrel. As the annular area between the mandrel and roll groove is less than the area of the cross section of the pierced billet, a reduction in area and corresponding elongation takes place. After the tube has passed the rolls and is on the long mandrel, the mandrel is pulled forward free from the tube. The tube is then raised and the mandrel is passed back again into the rolling position while the tube passes over the top of the rolls for the next pass. Successive passes are made in this manner until the desired wall thickness and diameter is obtained, reheating the billet as may be required.

This is the old hand method of rolling and is still used to some extent as it is easy to handle the tube to grooves of successively decreasing diameter using several mandrels. The method is slow and laborious and has been largely superseded by a mill in which all hand handling is eliminated. To accomplish this some slight changes were necessary in the rolling method. These changes consist principally in the use of but a single groove and mandrel. The varying area of the pass is obtained by simply raising rolls for the earlier passes and using a slightly smaller mandrel. The finishing passes are taken with the rolls in a fixed position, and with the required size mandrel for the finished inside diameter. The long mandrel is fixed permanently in position and the short mandrel only is removed after the passes.

To return the tube to the entering side of the rolls for the next pass, the top roll is elevated and the tube stripped from the long mandrel by an auxiliary set of rolls. On the entering side of the rolls the tube is received in a V shaped trough in which it is moved to the rolls by a pusher operated by compressed air. All these operations are mechanical except the removal of the short mandrel.

Hot Finished Seamless Boiler Tubes

The successful introduction of this mechanically operated mill made possible the "hot finished" seamless tube in the boiler tube sizes. Hand handling was too slow to allow the required thickness of wall to be obtained in one heat which is an essential requirement on account of finish. Rolling reduces the wall thickness of the pierced billet to gauges lighter than can be obtained by the piercing operation and gives the accuracy required for boiler tubes and other similar work. The sliding of the hot tube over the stationary mandrel however, causes scratches on the interior walls of the tube that are objectionable for some purposes and in all cases spoil the appearance of the finished tube. These scratches are removed by a following operation, which has come to be called "Reeling."

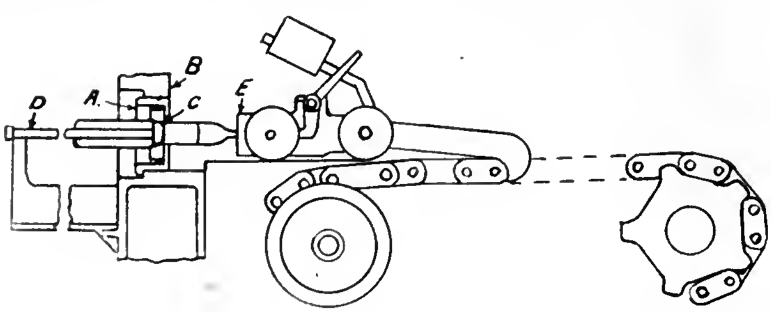


FIG. 9.

The reeling machine is very similar to a piercing mill of the roll type with axes in parallel planes, such as shown in Figure 1, but the rolls of the reeling machine are shaped to give contact over a considerable length of tube usually not less than a length somewhat greater than the tube diameter. The mandrel for reeling is cylindrical instead of conical as for piercing. The action of the rolls in giving the tube rotation and longitudinal travel is the same. Figure 8 shows the arrangement.

After the tube has been brought to required diameter and wall thickness by the rolling mill, it is conveyed to the reeling machine. Here the surfaces interior and exterior, are rolled in a direction approximately at right angles with the direction of rolling on the two high mill, resulting in the practical elimination of any scratches caused by the rolling mandrel. At the same time the tube is rounded up and the outside burnished. The reeling machine introduces a variation in diameter occasioned by variation in the pressure of the reeling rolls and in the heat, and this variation is corrected by passing the tube after reeling through a set of rolls with circular grooves of a diameter the same as the required finished diameter plus an allowance for shrinking in cooling.

Recapitulation

These are the standard hot operations in making a seamless steel tube. The piercing operation forms a tube from the solid blank. This tube varies greatly in diameter and wall not only from tube to tube but in the same tube at different points of its length. The rolling operation reduces the rough pierced tube to accurate circumference and wall thickness, but the rolled tube is not round nor is it smooth on the interior wall. The reeling machine smoothes the walls and rounds the tube but introduces a slight variation in the circumference which is removed by the final sizing operation.

Thus it is seen that each operation, after the piercing, is for the purpose of correcting and perfecting the preceeding operation. It is not essential that these operations be separated and placed on different machines in this way as it is entirely possible to complete the work in the piercing operations, but such a nicety of adjustment would be required to control simultaneously all the different factors, that it has been found simpler and cheaper to make a separation as described.

There is one variation occurring in the piercing operation that is not removed to any appreciable extent by the succeeding operations, that is, the eccentricity of the bore of the tube with the outside surface. The eccentricity varies directly as the wall thickness and is influenced by a number of factors; the heat of the blank; the ratio of longitudinal feed to rotation; the form of the rolls and mandrel and of the supporting guides, all have an effect. Even when

all these factors are as constant as it is possible to maintain them, a variation in eccentricity occurs. Under good conditions howeverr, about 50% of the product will be not more than 5% eccentric. The established limit for inspection is 10% eccentricity. This tendency to eccentricity must be taken into consideration in applying seamlesss tubes. Fortunately for most uses the maximum variation causes no serious inconvenience.

Drawing Bench Features

There are numerous uses to which seamless steel tubes are applied that require smaller variations from size, and a better surface than can be obtained by hot work. Also the practical limit for hot work is a tube not less than 1½ inches in the diameter and even that at this time is too small for economical production. Cold drawing is resorted to in order to obtain the smaller diameters and lighter walls, and to reduce variations in dimensions. The process is as old as the industry and simple in details, although these require a surprising amount of skill to obtain good work.

Figure 9 illustrates the essential features of a "drawing bench." A die A of the required size is supported in a die head B. This die controls the outside dimensions of the tube. Within the die is placed a mandrel C which controls the inside dimensions. The mandrel is anchored to the rear end of the bench by the rod D to prevent longitudinal movement. In front of the die is a gripping mechanism E by which the tube is pulled through the die. This gripping mechanism is moved by attaching it to a moving chain or to the piston of a hydraulic cylinder.

For cold drawing the hot rolled tube is prepared by reducing the diameter of one end by a forging operation. This is for the purpose of allowing the tube to pass through the die far enough to be seized by the gripping mechanism. After thus "pointing," the tube is pickled in diluted acid to remove all mill scale. It is then washed and lubricated.

Going to the drawing bench the mandrel rod with the drawing mandrel secured to it is inserted into the tube and the tube is placed on the bench with the pointed end projecting through the die to be gripped by the pulling mechanism. On attaching the gripper to the moving chain, the tube is drawn through the die and over the mandrel reducing the diameter and wall. The average reduction made at a single pass varies from about 18% for small tubes up to 25% for larger ones. Any number of passes can be taken but after each pass the tube must be annealed and again "pickled" and lubricated.

These are the standard operations in the production of seamless tubes. No mention has been made of finishing operations as there is little in these that is peculiar to the seamless tube; nor have the operations for forming and finishing the tubes producted by the cupping process been described, as, while of great interest, the tonnage produced by this process is comparatively small.

GRINDING WHEEL FLANGES

By C. W. Blakeslee*

THE flange plays a very important part in the protection and support of the grinding wheel. Opinions differ somewhat as to the diameter of flanges relative to the diameter of the wheel. However, my opinion is that the minimum diameter of flanges should not be less than one-half the diameter of the wheel and as much larger as possible consistent with grinding conditions. If possible use more than one set of flanges so that changes can be made as the wheel wears down.

Objections are somtimes made against st large-diameter flanges on account of interfering with the grinding on the side of the wheel. If it becomes necessary to do much of this class of grinding, it is advisable to equip the floor machine with a cylinder to carry ring wheels, which are made especially for side grinding, or the cup wheel with a protection hood. However, if the straight wheel is used for this purpose, do not forget that an unusual strain is put on the wheel and the greatest of judgment should be used in this operation. Side grinding on a straight wheel should be discouraged wherever possible and cylinder wheels recommended.

Grinding on the top of the wheel is a very dangerous operation. Many serious accidents have resulted in this method of grinding. If the work is allowed to ride over the wheel to the front it is likely to catch on the wheel and be carried rapidly to the hand-rest. The crash usually results in a broken wheel. While this class of grinding is extremely dangerous and should be discouraged, yet if such method becomes absolutely necessary, the operator should by all means place himself back of the machine so that the wheel will revolve from him rather than toward him as is the case when standing in front of the machine. This would prevent the wheel from at least catching the work and snapping it down to the hand-rest.

*Manager, Abrasive Material Co., Chicago.

The offices of the Machine Tool Department of the British Ministry of Munitions, Alfred Herbert, director, have been removed from Armament Buildings, Whitehall, S.W., to Queen Anne's Chambers, Dean Farrar Street, Westminster, S.W.

A CONVENIENT GEAR FORMULA

By H. R. S.

AS a reader of your instructive magazine, and one who takes a special interest in the section reserved for the answering of questions I would like to draw your attention to a formulae which I find very useful and would no doubt be of interest to readers of the paper.

The formulae would be of especial value to draftsmen as all dimensions are shown on the blue print. The formulae I refer to is used in the cutting of spur gears. It is very simply applied and could be used very readily.

In finding the diameter of a spur gear if the number of teeth and the pitch are known the rule of adding two (2) to the number of teeth and the sum divided by the pitch will give the required diameter to be turned on the lathe. Thus the diameter equals the number of teeth in the gear, plus two, divided by the pitch. And by reversing the formulae we can find the number of teeth if the diameter and pitch are given, similarly the pitch can be found by substituting the known values in the formulae.

Thus if:

T = the number of teeth.

D = the diameter.

P = the pitch of the finished gear.

We can write the formulae as follows and substitute the knowns and eliminate finding the required dimension:

(i) $D = \dfrac{T+2}{P}$, (ii) $T = DP - 2$,

(iii) $P = \dfrac{T+2}{D}$

Trusting that the above may be of use to your valuable paper, and wishing you continued success.

Shipbuilder's Offer to Women Workers.—Speaking at the opening of a munition works canteen provided for the women and girls employed at the Arrol-Johnston Works, Paisley, Scotland, Sir William Beardmore said that the firm were desirous of doing all they could to make the women comfortable and to encourage them. As an inducement, he promised all the female workers a bonus of 10 per cent. on the wages earned by them from January 1 of this year till the close of the war, on condition that they kept regular time, gave satisfaction to the manager, and that there would be no abstention from work unless through illness. The sum would be paid to the workers at the termination of the war.

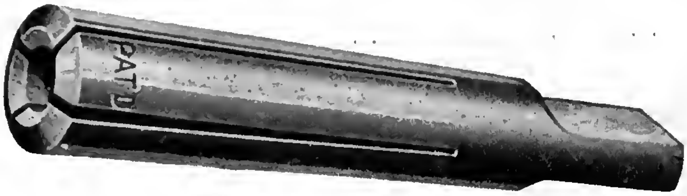
PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

TRUE DRIVE TAP CHUCK

A DEVICE which possesses great simplicity and efficiency is being put on the market under the name of "True Drive," Tap Chuck, by Scully-Jones & Co., Chicago.

It is made of a single piece of hardened steel, and its use involves no screws, pins, frictions or other accessories. As will be seen from the illustration the article is of the same external shape as a drill socket, the differences being the provision of a parallel hole, and the slitting of the body at four points.



TAP CHUCK FOR USE IN DRILL PRESS

When the chuck, with a tap in position is inserted in a drill spindle, the sections are compressed on the shank of the tap and take hold firmly. Actual usage has shown that taps varying as much as 1-32 in. from a given size are driven satisfactorily, and although taking up less room than a common drill chuck, it holds taps perfectly true. No dependence is placed on the square of the tap as many otherwise good taps are not perfectly made in this respect.

This tap driver is made with a standard Morse taper and can be used in any drill with a hole of corresponding taper. regular adaptor sockets or sleeves being used according to size when necessary.

VERTICAL MILLING MACHINE FOR SHELL FUSE TIMING RINGS

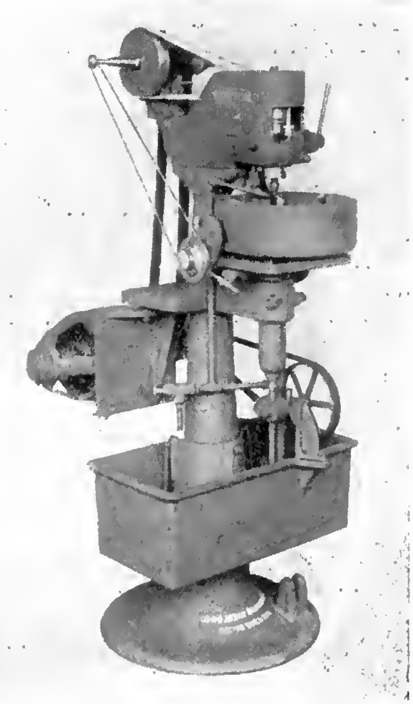
THE accompanying illustration shows a vertical milling machine which as been developed for grooving the timing rings of shell fuses. The work is held in a rotary holder which is driven from an extension on the countershaft by a round belt and is surrounded by a pan secured to the table. The drive is through spur gearing and worm and worm wheel. Suitable stops are provided which gauge the length of the groove very accurately.

As shown in the photograph the fixture makes one revolution per minute, which can be increased or diminished by changing the size of the pulleys. When the timing ring is in position on the work holder, the feed lever at the right of the cutter head is swung down, feeding the cutter into the work until the spindle sleeve flange is in contact with the micrometer collar. The mechanism is so arranged that the cutter will remain in this position without any further attention from the operator, until the fixture strikes the stop, when the lever is swung up, lock handle thrown back and work removed.

The spindle is made of hardened tool steel, runs in ball bearings, and has a vertical feed by hand of two inches. A micrometer stop reading in thousandths is provided, which insures the same depth of cut on all pieces to be grooved.

Countershaft should run 2,000 revs. per min. This speed is subject to variation according to the nature of the work. Tight and loose pulleys $3\frac{1}{8}$ in. x $1\frac{5}{8}$ in. are mounted on countershaft so that it can be driven directly from line shaft or by motor.

This machine is the product of the George Gorton Machine Co., Racine, Wis., who designed it solely for routing timing rings for shells. The net weight without motor is 900 lbs.



FUSE RING GROOVING MACHINE.

EXPANSIBLE BORING CUTTERS FOR ECONOMIZING HIGH SPEED STEEL

THE upkeep, expense and ultimate waste of tool steel when used in the form of double-ended boring cutters has been brought very forcibly to the notice of users of machine tools by reason of the excessively high cost of high speed steel.

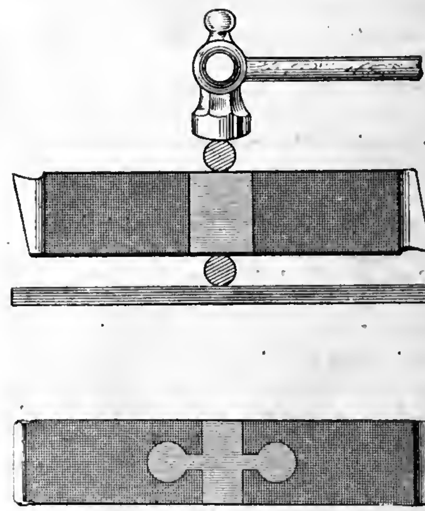


FIG. 1

Cutters of the type referred to are particularly wasteful of metal, while the cost of a smith's time in expanding the cutter, followed by grinding time, make each dressing of the tool a costly operation.

"Gauge-All" is the name given to a method of constructing these tools so that they may be expanded repeatedly, quickly, accurately, and cheaply, which has been perfected by an English mechanic, and has been placed on the market by Vislok, Ltd., of London, Eng. The principle of the invention which is fully protected by patents, consists of the connection of two pieces of high speed steel by means of a centre section of special metal alloy. After a few cuts have been taken and the cutter is worn undersize, it is expanded up to size again by hammering the relatively soft centre which causes the cutter to expand lengthwise.

The details of construction are shown in Fig. 1, which gives two views of a boring cutter. The upper one shows the cutter held between the arms of a wire clip while being struck with a hammer. The lower view shows the special metal

key which is the feature of the device. Fig. 2 shows the shape of clip used and also a tool which finished more than 200 holes 3 in. dia. x 10 in. deep, to a limit of .0002 in. Owing to the wear on the cutters, readjustment by the old method of heating and rehardening caused the scrapping of solid cutters so soon, that the number of holes machined by them were a mere fraction of those finished by the expansible cutters.

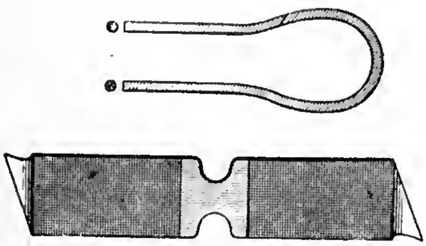


FIG. 2

Expansion by hammering can be repeated as often as necessary until the edges of the slots A, A, reach the edges of the bar, see Fig. 3, after which new centres can be inserted by the makers at a moderate cost.

More than a year's use on steel casting work has shown there is no tendency for the soft centre to bend or break, and as it is expanded it acquires hammer hardness which counteracts the reduction of size.

Gauge boxes are easily made which enable operators to set up tools to accurate sizes. One of these is shown in Fig. 3. Machine steel can be used to advantage in making these if the inside of the ends be case hardened, while provision

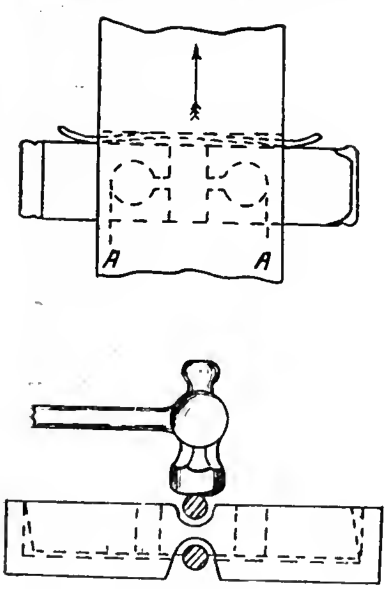


FIG. 3

for adjusting one end makes it possible to use one box for a number of sizes.

These cutters are sold under the trade name of "Gauge-All" and are now in use by the Admiralty and several leading engineering firms in Britain.

CONCERNING MANILA ROPE

By F. E. Weiss

POSSIBLY there is no article in the outfit of a railroad construction organization or of a contractor that suffers more neglect and abuse than Manila rope. In nine cases out of ten, this condition is due more to a lack of knowledge than to wilful neglect. The best rope for all purposes is made from Manila hemp, and little rope over one inch in diameter is made from anything else.

EQUIPMENT FOR VICTORIAN RAILWAYS

Tender forms, specifications, indents and drawings have been forwarded by Commissioner D. H. Ross, Melbourne, for equipment required by the Victorian Railways, Melbourne. These tender forms, etc., are open to the inspection of Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer File No. A-1435). Particulars of the requirements of the Victorian Railways, together with the date on which the tenders close at Melbourne, are briefly outlined thus:

One 10-inch gap lathe, tools, gears, etc., March 29, 1916.

300 yards Morquette cloth (sample at Department of Trade and Commerce, Ottawa), March 29, 1916.

One 1-ton electrically-operated hoist, April 12, 1916.

5,600 pounds wool waste, April 19, 1916.

Mails leave San Francisco, February 29, Vancouver, March 15, and San Francisco, March 21, and are due to reach Melbourne on March 22, April 8, and April 12 respectively.

Purity Test

A test for ascertaining the purity of Manila hemp rope consists in forming balls of loose fiber from the ropes to be tested and burning them completely to ashes; pure Manila burns to a dull grayish-black ash; sisal leaves a whitish-gray ash; a combination of Manila and sisal yields a mixed ash resembling the beard of a man turning from black to gray. Manila hemp is frequently adulterated with New Zealand flax and Russian hemp, both of which are much inferior in strength.

It is not always true that the highest priced material is the best, and there are no doubt many cases where from lack of knowledge or time for investigation, a better grade of material is purchased and used than is necessary. The price of this material is governed largely by its quality, but the selection of the quality should be governed by its suitability to the work in hand.

Ropes in Service

Ropes in service deteriorate in two ways. There is the wear on the outer surface that can readily be seen, and the stretching, bending, crushing and breaking of the inner fibers that cannot be discovered without a careful examination. Should these conditions develop more rapidly than the service in which the rope is used seems to warrant, they may be due to the following causes:

The first may be caused by chafing, resulting from ropes rubbing against each other or dragging across hard materials, or by running over sheaves having too small a groove. The latter may be due to overload or to running over sheaves or pulleys of much too small diameter. Ropes do not give out all at once, and therefore need much care and attention.

Manila hemp is a vegetable fibre and is susceptible to the action of water and air the same as an unprotected piece of wood. In fact, the hardest wear on a rope is exposure to all kinds of weather. This cannot be avoided in construction work; therefore, when a rope has become wet and muddy, it should be cleaned, dried and stored in a well ventilated place. Wet rope placed in a box or unventilated storeroom is likely to rot or ferment and will become worthless in a very short time. Ropes that must necessarily be constantly exposed to the weather are tarred frequently, but as the tar affects the tensile strength, it cannot be used on ropes that are subject to hard use on derricks and cranes. Tarred ropes may be used for guy lines, the rigging of ships or similar work.

It is generally conceded that moisture will not injure a rope in storage, provided the storeroom is well ventilated, and in fact some dealers advocate a damp storeroom. On the other hand, a rope may become seriously injured by becoming too dry, because the fibres become brittle. A rope should not be allowed to freeze after becoming very wet, or if frozen, should not be used, because the frozen fibres will break and thus make it useless. Neither should rope be piled against radiators or steam pipes for obvious reasons.

Rope Failures From Overloading

The failure of ropes is more likely to be due to overloading than to any other cause. Should a rope be subjected to an overload, it may be shown by the twist coming out of it, or by one of the strands slipping out of its proper place. In the handling of heavy loads with a derrick or crane, the load should never be applied suddenly or with a jerk, not only because the stress will be many times

that of the weight to be lifted, but it will cause deformations in the rope that start deterioration.

Should there be a kink in the rope, the damage may be serious enough to cause failure, and in any event the rope will have lost a good deal of its strength and value. Ropes used on derrick cranes and pile drivers wear out very rapidly. It is said that a rope $1\frac{1}{2}$ inches in diameter will wear out in handling from 7,000 to 10,000 tons of coal, while a transmission rope of the same size, running 5,000 feet per minute and carrying 1,000 horse-power over sheaves 5 feet and 17 feet in diameter, will last for years.

Small Sheave Effects

The rapid wear of ropes used on derricks and pile drivers is due to their passing over comparatively small sheaves under load. When passing over a small sheave, the rope is subject to sharp bending, which causes the fibers to slide lightly on each other, and, as they are somewhat rough, the friction ultimately causes the fibers to break. Frequently upon opening up ropes of this kind, it is found that some of the inner fibers have been ground to a fine powder.

Manufacturers aim to overcome this difficulty by treating the fibers with tallow or graphite, or both, but there seems to be considerable difference of opinion as to the value of such treatment. Tallow-laid rope is not affected as much by weather conditions as rope not so treated. Should it be necessary for a rope to run over two sheaves, bending first in one direction and then in another, the difficulty last described is much exaggerated, and is much like bending a pliable wire first one way and then the other. It will soon break.

Rope Splices and Slings

It is frequently necessary to splice the ends of two ropes together in order to make one long rope. Either a short splice or a long splice may be used. If properly made, the short splice will develop the full strength of the rope, but it cannot be used over a sheave because it is considerably thicker than the original rope. The long splice can be used over a sheave, but it cannot be expected to give as good service as an unspliced rope. The short splice is more quickly made.

Slings made from Manila rope for handling and hoisting heavy materials do not always receive the care and attention that they should, largely because of a lack of knowledge of what a sling will stand. Many advocate the use of new rope, and this is without doubt the safe plan. A new rope, however, is too stiff and it is better, where possible, to use parts of a rope that have been limbered up by a day's service. There are others that advocate the use of old rope for this purpose. If this is done, care should be taken to select pieces that have not been overstressed or that have not been working over sheaves. An examination can easily be made by opening up the strands, and if the inner fibers show deterioration, the rope should not be used for slings. Slings are made by splicing the two ends of a rope together, using generally what is known as the short splice.

On construction work and during wet weather, slings are subject to severe usage. When muddy, they should be thoroughly cleaned, preferably with a hose, before the mud has been allowed to dry. They should then be allowed to dry under shelter, but never in the hot sun. When slings are sent to the tool car or toolroom for storage, they should be inspected carefully and such as are not fit for continued use should be discarded. Those in good conditions should be hung on suitable pegs. Slings are frequently called for in a hurry and under such conditions there is not always time to make an examination, or it may be overlooked. It is well to be on the safe side because the failure of a sling may result in serious injury to the workman or a fall of only a few feet may damage or utterly ruin a piece of machinery.

Slinging a Load

The method of attaching a sling to a load should always be delegated to a reliable and experienced man, and whether one or more slings are to be used will depend not only on the weight of the load to be lifted, but also on its shape. In placing a sling on a load, care should be used to see that the load is evenly distributed on the two sides of the hoisting hook and also that the turns of the sling do not overlap, thereby throwing an excessive stress upon one part of it.

The stresses that are thrown upon slings and ropes vary a great deal with conditions, and they are often influenced to a marked degree by circumstances, which the casual observer might consider trivial and unimportant. In particular the inclination or obliquity of the sling, in those parts which lie between the supporting hook and the points at which the sling first touches the load, must be carefully considered, as it is a highly important feature in connection with safety.—From an article in the Railway Age Gazette.

Calgary, Alta.—Although the exact figures are not yet available, the Provincial Department of Mines estimates the coal production of Alberta for 1915 at approximately 3,500,000 tons, of which about 1,000,000 tons were produced in Edmonton district.

FURTHER SHRAPNEL ORDERS

IT is announced from Ottawa that an order for 800,000 eighteen-pounder shrapnel shells has been received by the Imperial Munitions Board from the British Ministry of Munitions. This is the first large order which has come to Canada since the present Imperial Munitions Board succeeded the old Shell Committee, the board's energies having been directed chiefly towards hastening deliveries on orders placed some time ago. It is probable that the new orders will be allotted in the form of renewals to firms which are already engaged in the manufacture of shrapnel shells.

The munitions industry in Canada has developed a greater capacity for turning out eighteen-pounder shrapnel shells than for the manufacture of any other and is well able to take care of the large order which has just been received. The value of the order is not stated, but based on prices reported for orders placed during last year, it should be worth between $10,000,000 and $12,000,000.

The news of the order will be welcomed by munition manufacturers, many of whom have been somewhat uneasy over the prolonged lull in the placing of new business. A good many of them have their capacity taken up for some months to come on old orders, but have been waiting for news that would assure them against a sudden stoppage of operations late in the year.

This most recent shell order is believed to be merely the precursor of others and it has also been rumored recently that new business of an important kind is about to be placed in Canada by the Allies for supplies other than shells. Such business may involve arrangements for banking credits, and these will no doubt take care of at least part of the business. Apart from that, Europe is averse to parting with more gold to the United States, and on economic as well as national grounds, payment in Canada will be increasingly favored, provided Canada can supply in quantities the class of supplies required. The prospects that the already large volume of war orders will be materially increased in the next few months are considered excellent.

Tool Steel Price Regulation.—Terms have been arranged between the British Minister of Munitions and the makers of high-speed steel in the Sheffield district whereby 14 per cent. tungsten high-speed steel is to be quoted at 70 cents per lb., and 18 per cent. tungsten at 95 cents per lb. net. cash, at customers' works. These refer to the home trade only. Makers are full up with orders, the majority having contracts which will keep them actively employed for eighteen months to two years.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor.

Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.
B. G. NEWTON - - - - - - Advertising Manager
Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. FEBRUARY 10, 1916 No. 6

SHIPBUILDING IN CANADA

AS was to be expected, the wholesale destruction of the merchant marine of Great Britain and her Allies, and the practical cessation of merchant shipbuilding in those countries have turned attention to Canada's possibilities for the establishment and development of a gigantic shipbuilding industry. It is hinted that even now her opportunity is available, and relative to this we might say that the meantime opportunity can be stated as fact in one respect. Orders for the construction of ocean going vessels are simply being showered upon Canadian shipbuilders at the present time, but in every case they are being turned down. The lack of steel is, of course, one reason, the lack of skilled help another reason, and arising out of a phase of the war situation which we may not here disclose, are to be found the elements constituting the third reason.

Steel for shipbuilding purposes has, of course, to be imported into Canada, and even with the end of hostilities and the advent of a boom in shipbuilding the world over, it is a moot point on that account whether we will feel any abnormal activity effects. Steel will continue to be for many months subsequent to the war a scarce commodity, even scarcer than at present so far as ship plates and shapes are concerned. Unless, therefore, some steps are taken now to meet the situation when the real opportune moment arrives, little better than prolonged normal activity is likely to be experienced.

The labor situation may, however, affect our shipbuilding possibilities to their detriment to an even greater extent than will the steel situation in the matter of the cost of the former. It is generally assumed that steel and labor costs will each be considerably higher than those existent in pre-war days, notwithstanding, their comparative costs as between Canada, Great Britain and the United States will have a determining effect in placing contracts here.

The shipbuilding industry in Canada may be said to be on the eve of being established on a foundation never before available and of being developed to a degree of importance hitherto undreamt of. The cost of steel may possibly be beyond the power of our Government, our shipbuilders, or their employees to control, but the latter will undoubtedly have a large say in the matter of labor cost.

With labor, therefore, there rests largely the future of shipbuilding in Canada. If its demands are extravagant, then a world boom in shipbuilding will give no evidence of its existence here, and an industry which contributes so much to the commercial success of other countries will continue to be reckoned as having to eke out within our borders the like precarious existence as formerly.

Ship repairing plants on our lake, river and ocean shores are recognized necessities of our national existence, but real, up-to-date shipbuilding and marine engineering plants should be even more so. We are possessed of the latter, yet their maintenance in the past has been one continuous struggle against almost insuperable odds. If we may not be able to modify the steel situation, community of effort by employer and employee can offset largely its handicap.

CANADIAN NATIONAL EXHIBITION

PLANS are already being formulated for this year's Canadian National Exhibition, and strange to say, little attention is apparently being given the all-important matter of stimulating our manufacturing and industrial enterprise relative to both our own domestic needs and the export opportunities that the war continues to open up and lay to our hand. We learn that this year's exhibition will assume largely a military aspect. Modern methods of warfare will be played-up, and an attempt be made to feature war in its actuality—casualties excepted. The midway shows are also to be hand-picked, if you please.

We had thought that the war was already in our midst in a very real sense, so much so that a caricature of it might be reckoned both ill-timed and ill-conceived. Again, why should so important an undertaking be allowed to develop a tendency towards becoming a gigantic picture show. The policy that appeals only to the senses of our people, and makes its platform a record-breaking attendance and a huge, immediate profit, whether in peace or war time, is both short-sighted and narrow, and courts disaster ultimately.

The exhibition of 1916, more so than any of its predecessors, calls for a broad and comprehensive display of our manufacturing capacity and enterprise. Our metal-working plants — to take but one branch of the above—have during the past eighteen months in the sphere of munitions production, earned for themselves high distinction for grappling with and solving successfully problems hitherto foreign to their experience and training. A lull is now evident in munitions manufacture and attention is being directed to channels in which the wealth of experience acquired may be equally fruitful of results. Our metal-working plant managements, large and small, are casting about for commodities to manufacture, either for domestic or foreign consumption, and the knowledge that our exhibition authorities are prepared to foster and encourage the efforts put forth in these directions, by specially featuring such products, will not only be an additional incentive, but act as a powerful agent in achieving results.

War is grim and sordid; it is with us every day and every hour of the day, and we are very much in earnest about it. We can afford, however, to abate it as a ruling passion, and all the more so when it leads to neglect of our economic responsibilities. The year 1916 calls for a manufacturing propaganda, intensive, broad and educative by our exhibition executive, and only by the latter rising to the opportunity and making the most possible out of it, will the institution continue to justify its existence as a factor in our national, industrial and commercial upbuilding.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45
Lake Superior, charcoal, Chicago	19 75
Michigan Charcoal iron.	28 00
Ferro nickel pig iron (Soo)	25 00

	Montreal.	Toronto.
Middlesboro, No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Summerlee, No. 1	33 00	.....
Summerlee, No. 3	32 00	.....
Victoria, No. 1	27 00	.....
Victoria, No. 2X	26 00	.....
Victoria, No. 2 plain	26 00	.....
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	2.75
Steel bars, 2 in. and larger, base	4.00
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	3.00
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	2.50
Structural shapes	2.50
Plates	2.70

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

Freight, Pittsburgh to Winnipeg

64.9 cents carload; 85.1 cents less carload.

BOILER PLATES.

	Montreal	Toronto
Plates, ¼ to ½ in ,.100 lb.	$3 00	$3 00
Heads, per 100 lb.	3 10	3 20
Tank plates, 3-16 in.	3 25	3 30

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto.
Lake copper, carload	$28 00	$27 50
Electrolytic copper	28 00	27 50
Castings, copper	27 00	27 00
Tin	45 50	45 50
Spelter	22 00	21 00
Lead	8 00	8 00
Antimony	50 00	45 00
Aluminum	68 00	68 00

Prices per 100 lbs.

WROUGHT IRON PIPE

Prices in effect Jan. 24, 1916

Buttweld

Per 100 feet	Black	Galv.
¼ and ⅜ in.	$ 2 52	$ 4 23
½ in.	3 15	4 89
¾ in.	3 68	6 04
1 in.	5 44	8 93
1¼ in.	7 36	12 08
1½ in.	8 80	14 44
2 in.	11 84	19 43
2½ in.	18 72	30 71
3 in.	24 48	40 16
3½ in.	29 44	48 30
4 in.	34 88	57 23

Lapweld

	Black	Galv.
2 in.	13 32	20 91
2½ in.	19 31	31 30
3 in.	25 25	40 93
3½ in.	30 36	49 22
4 in.	35 97	58 32
4½ in.	45 72	71 76
5 in.	53 28	83 62
6 in.	69 12	108 50
7 in.	92 82	146 40
8 in.x25 lbs. per ft.	97 50	153 80
8 in.x28 lbs. per ft.	112 30	177 10
9 in.	134 60	212 20
10 in.x32 lbs. per ft.	124 80	196 80
10 in.x40 lbs. per ft.	160 70	253 40

Ontario list—All points from Kingston and west to, but not including, Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
¼ in. and ⅜ in.	$ 2 46	$ 4 17
½ in.	3 06	4 80
¾ in.	3 57	5 92
1 in.	5 27	8 76
1¼ in.	7 13	11 85
1½ in.	8 53	14 16
2 in.	11 47	19 06
2½ in.	18 14	30 13
3 in.	23 72	39 40
3½ in.	28 52	47 38
4 in.	33 79	56 14

Lapweld

	Black	Galv.
2 in.	$ 12 95	$ 20 54
2½ in.	18 72	30 71
3 in.	24 48	40 16
3½ in.	29 44	48 30
4 in.	34 88	57 23
4½ in.	44 45	70 49
5 in.	51 80	82 14
6 in.	67 20	106 60
7 in.	90 44	144 00
8 in. x 25 lbs. per ft.	95 00	151 30
8 in. x 28 lbs. per ft.	109 40	174 20
9 in.	131 10	208 70
10 in.x32 lbs. per ft.	121 60	193 60
10 in.x40 lbs. per ft.	156 60	249 30

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$33 00
Open-hearth billets, Pittsburgh.	34 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	45 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 20	$3 15
Cut nails	3 15	3 20
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	3 45	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	65
Stove bolts	75
Plate washers	40
Machine bolts, ⅜ and less	57½
Machine bolts, 7-16 and over	47½
Blank bolts	47½
Bolt ends	47½
Machine screws, iron, brass	35
Nuts, square, all sizes	3c per lb. off
Nuts, hexagon, all sizes	3¼c per lb. off
Iron rivets	60
Boiler rivets, base, ¾-in. and larger	$4.10
Structural rivets, as above	4.00
Wood screws, flathead, bright	85 p.c. off
Wood screws, flathead, brass	50 p.c. off
Wood screws, flathead, bronze	45 p.c. off

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$16 25	$16 00
Copper, crucible	19 50	19 00
Copper, unch-bled, heavy	19 25	19 00
Copper wire, unch-bled.	19 25	19 00
No. 1 machine compos'n	15 00	15 00
No. 1 compos'n turnings	12 50	12 50
No. 1 wrought iron	11 75	11 00
Heavy melting steel	9 00	10 00
No. 1 machin'y cast iron	14 75	14 00
New brass clippings	12 25	12 50
No. 1 brass turnings	10 00	9 50
Aluminum	32 00	31 00
Heavy lead	6 00	6 00
Tea lead	5 00	5 00
Scrap zinc	13 50	13 50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	20%
At warehouse	10%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS

Solder, half-and-half	0.24½
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	10.45
Red dry lead, 100-lb. kegs, per cwt.	11.50
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.28½
Benzine, single bbls., per gal.	0.28
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	1.02
Linseed oil, boiled, single bbls.	1.05
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	5.00
Lead Wool, per lb.	0.11
Pure Manila rope	0.20
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23
Lard oil, per gal.	1.28
Union thread cutting oil	0.54
Imperial quenching oil	0.38

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 40%

PROOF COIL CHAIN.

¼ in.	$9.00
5-16 in.	5.90
⅜ in.	4.95
7-16 in.	4.55
½ in.	4.00
9-16 in.	4.20
⅝ in.	4.10
¾ in.	3.95
⅞ in.	3.80
1 inch	3.70

Above quotations are per 100 lbs.

TWIST DRILLS.

	%
Carbon up to 1½ in.	55
Carbon over 1½ in.	25
High Speed	
Blacksmith	55
Bit Stock	60 and 5
Centre drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 50	$3 75
Canada plates, dull, 52 sheets	3 50	3 60
Canada Plates, all bright	4 60	4 75
Apollo brand, 10¾ oz. galvanized	6 40	6 50
Queen's Head, 28 B.W.G.	6.75	7 00
Fleur-de-Lis, 28 B.W.G.	6 50	6 75
Gorbal's Best, No. 28	6 40	6 40
Viking metal, No. 28	6 10	6 10
Colborne Crown, No. 28	6 00	6 50
Premier No. 28, U.S.	6 50	6 50
Premier, 10¾ oz.	6 75	6 75

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$17 00	.....
1¼ in.	17 00	.....
1½ in.	17 00	11 55
1¾ in.	20 00	11 55
2 in.	20 00	11 00
2¼ in.	22 00	12 10
2½ in.	24 00	14 15
3 in.	32 00	14 60
3½ in.	35 00	18 00
4 in.	40 00	23 00

Prices per 100 feet, Montreal and Toronto.

WASTE.

WHITE.	Cents per lb.
XXX Extra	.15¼
Grand	.14
X L C R	.12¾
X Empire	.11½
X press	.10¼
COLORED.	
Lion	.09
Standard	.08
Popular	.07
Keen	.06
WOOL PACKING.	
Arrow	.20
Axle	.14
Anvil	.10
Anchor	.08
WASHED WIPERS.	
Select White	.09
Mixed Colored	.07
Dark Colored	.05½

This list subject to trade discount for quantity.

BELTING RUBBER

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble,	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$12.75
3-16 in.	8.85
¼ in.	6.15
5-16 in.	4.90
⅜ in.	4.05
7-16 in.	3.85
½ in.	3.75
⅝ in.	3.60
¾ in.	3.60

Prices per 100 lbs.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.06
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy.	.30
Copper sulphate	.15
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	3.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.20
Zinc sulphate	.07

Prices Per Lb. Unless Otherwise Stated.

ANODES

Nickel	.47 to .52
Cobalt	1.75 to 2.00
Copper	.27 to .30
Tin	.45 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs	.4½ to .06
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.04 to .06
Emery composition	.07 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., Feb. 5, 1915.—The general situation throughout the industrial field shows signs of continued activity. The impending distribution of further shrapnel contracts by the Imperial Munitions Board has strengthened the outlook, which has been further stimulated by expectations regarding additional orders for certain necessities other than shells.

Steps have been taken by the Montreal Board of Trade to approach the Dominion Government in connection with the advisability of sending a commission of qualified business men to France, Russia, and other European countries, to secure information that would be of value to this country in the gaining of foreign trade at the conclusion of the war. The possibilities in this direction are great, and the time seems opportune for such action.

Pig Iron

The present production of pig iron is taxing the blast furnaces to the limit, and increased facilities are constantly being added, but the demand is still in excess of the supply, and with the forced output that is being maintained, it is not to be expected that the furnaces can be operated much longer without overhauling. However, the gradual increase in available furnaces will materially relax the high tension at which existing plants are being worked. Prospects indicate an increased production of foundry iron during the coming months.

Steel

The situation remains unchanged, as production is at its height, and it would seem impossible to make any changes likely to increase the present output. The heavy demand for munition steel and the constant rise in price has caused many of the small consumers much anxiety as to where they will be able to secure their future requirements, and in many instances users assert that the high prices are getting beyond their reach. Construction work, where considerable steel is necessary, is feeling the pinch, especially when there is a competition with other materials.

The export trade, while very heavy, seems to have little to do with prices. Even with ocean rates at a reasonable figure, it would be next to impossible to accept all the export trade offered.

The placing of further orders for shrapnel shell in Canada will make increased demands upon the steel producers. Added to the abnormal demand for all kinds of steel the cost of production has materially increased, and it is anticipated that further advances will come in the near future. The requirements of the sheet steel users are still excessive, and the mills are unable to keep pace with the demand. Many of the producers refuse to quote on galvanized sheets, owing to the irregular price of the raw materials. The general situation in steel is gradually becoming acute, and little prospect of relief seems evident at the present writing.

Local dealers have made no changes in last week's quotation, but intimate that some changes are possible before the close of the week.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Metals

The general tone of the metal market is very strong, and advances are shown on many sides. The local market in copper, which remained firm during the past week, has become stronger with higher prices. Tin remains quiet and inactive Increased demand by brass manufacturers has given strength to spelter, and higher prices are quoted, but indications point to a weaker market within a short period. Lead has advanced during the week, and antimony has jumped, following cable reports from the far East. The present situation is very unsettled, and the outlook for the future is rather clouded, as international developments may completely upset all previous calculations.

Copper.—The foreign market is stronger and prices have again advanced. Prompt and also February and March electrolytic is in demand, but consumers are having much difficulty in securing delivery. Producers intimate that they have very little for sale, and it is almost impossible to have early delivery, even at the advanced prices. Many orders have been placed for April, May and June at present prices, and in some instances even higher.

Diplomatic conditions in the States may, at any time, have a serious effect upon the market, any untoward developments being likely to accelerate the "preparedness" campaign with possible restrictions on the export of munitions materials.

Local dealers report very good business at the advanced prices. This week's quotations are: Lake, $28; electrolytic, $28, and castings, $27; the two former being an advance of ½c per pound.

Tin.—The present market is very quiet and featureless, but prices are firm. Considerable metal is in sight; in fact, the amount of tin afloat, en route from the Straits to America, is very great, and in the event of a favorable passage there is a possibility of a decline on present prices. However, the confirmed report that the "Takata Maru," with 50 tons aboard, has been sunk, is keeping the market very unsettled, and dealers are showing some anxiety in making sales.

The accumulation of large quantities of tin at Liverpool is causing a feeling of unrest, and if the present Government restrictions are removed it is expected that a weaker market will result. Local quotations remain firm and unchanged at 45½c per pound.

Spelter.—The recent strong demand for spot and early delivery has resulted in strengthening the market. Freight embargo on several of the Eastern roads has caused a shortage in certain districts in the States, creating a demand for immediate supply, which makes it very difficult to place orders for first quarter shipment, as producers are unable to guarantee delivery.

The sensational activity shown in the production of the brass mills has created an exceptionally heavy demand for spelter, and this will likely absorb the increased production during the immediate future, but the indications of a still greater supply may make the advance one of short duration.

Following the advance on the foreign markets, local dealers are quoting 22c, which is an advance of 1c over last week's prices.

Lead.—The regulations of the British Government controlling the trade of lead and other metals has had no material effect upon the United States or local markets. When the restrictions were first suggested, the market was inclined to weaken, but considerable improvement has since been evident, and present conditions are of a better tone. The situation prevailing in Government circles across the line, however, may affect the metal market at any time. The market here has grown stronger during the week, and dealers are asking an ad-

vance of quarter of a cent per pound. Montreal dealers are quoting $8 per hundred.

Antimony.—Cable reports from the Far East indicate a very strong market, with higher prices, and buyers are very active covering their early requirements. Some difficulty is being experienced by consumers and dealers, as sellers are shy on taking orders. The local quotation of 50c shows an advance of 5c a pound.

Aluminum.—The action of the British authorities to prevent aluminum from reaching the enemy is causing shippers some uneasiness, as they do not like to risk seizure of shipments. This has had the effect of making prices somewhat lower and the market weak. However, local quotations remain unchanged at 68c a pound.

Machine Tools and Supplies

The general demand for machine tools is lighter than for some time past, but it is expected that when the recent order for additional shells has been given out there will be increased inquiries for some new equipment. Many of the firms who have been making the 18-pounder high explosive shell are contemplating changing their equipment so as to handle larger sizes, as no further orders for the former shell will be placed in this country. However, the possibility of orders for 3-inch Russian and French ammunition will somewhat counteract the withdrawal of the British orders, and in any case it is expected that the machine tool industry will receive new impetus when the decision of the British Government in connection with additional important business is definitely known.

The demand for supplies still continues, and prices are constantly advancing owing to the higher cost of the raw materials. It is very difficult to quote prices, as many lists have practically been withdrawn. Babbitt is quoted as high as 60c per pound. Benzine is selling at 26c to 28c. Files are listed at from 65 to 75 per cent. off. Gasoline, 26c to 29c per gallon. Machine screws, iron, are quoted at 25 to 35 per cent., and brass 5 to 12 per cent. off list price. All quotations are nominal and subject to change at any time.

Old Materials

Considerable activity is noted in the handling of scrap metals, and dealers report very good business in many lines; many of the iron mills are using large quantities of old material, and trade in heavy melting steel scrap is still very brisk. Old copper has advanced ½c a pound, light being quoted at $16.25; crucible, $19.50; heavy, $19.25; and copper wire, $19.25 per 100 lbs. No. 1 machine composition is ½c stronger, being quoted at 15c per pound. New brass clippings are now 12¼c, which is an increase of ½c per lb.

Toronto, Ont., Feb. 8.—The news that an order for eight hundred thousand 18-pound shrapnel shells has been placed with the Imperial Munitions Board by the British Ministry of Munitions will be received with considerable satisfaction in machinery circles. This will allay fears expressed in some quarters that no more orders for shells were probable. While this is true of 18-pdr. H. E. shells it does not apply to shrapnel as enough orders for the latter have already been distributed to keep the shell plants busy until the fall, if not longer. This order will revive interest in the shell industry and also stimulate the machine tool business.

The Dominion revenue from customs in January showed an increase of more than 100 per cent. over the corresponding month of last year while for the ten months of the fiscal year the Customs collections decreased by nearly 18 million dollars. These figures confirm the expectation that the special war taxation will be sufficient to bring the revenue up to the required total. The estimates tabled in the House recently by the Minister of Finance show that heavy reductions have been made in both ordinary and capital expenditure on public works, and in capital expenditure on railways and canals. The policy of retrenchment inaugurated at the outbreak of the war will be continued this year for public works. Appropriations for works already under construction have been made but no expenditures on new works have been authorized.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

Steel Market

The market continues strong and price very firm with an upward tendency. As was anticipated last week, prices of cold rolled steel shafting have advanced, the new discounts being 20 per cent. at mill and 10 per cent. at warehouse. There is no abatement in the heavy demand in the primary market for shafting, the mills being sold up for several months ahead. Specifications are running much beyond the capacity of the makers to supply their customers.

The new prices on wrought iron pipe in connection with the advance announced last week are given in the selected market quotations. A change has been made in the arrangement, resale prices being now given instead of discounts as formerly. Wire nails have advanced 10c and are now quoted at $3.15 base per keg, while cut nails are 20c higher, being quoted at $3.20. The advance in wire nails is due to the scarcity and high price of wire rods which are being quoted at $50 to $55, four to six weeks delivery. Stove bolts have advanced, the new discount being 75 per cent. The extraordinary activity at the mills shows no sign of abatement, and the recent order for shrapnel shells will give additional tonnage for the mills to take care of and keep the forging plants busy.

The galvanized sheet market is very firm and higher prices are looked for in the near future. There is no improvement in the situation, and less than 50 per cent. of the galvanized plants in the States are in operation. Black sheets are higher and deliveries getting more backward, while spelter is also higher in price. The high-speed tool steel situation shows no improvement and future prices are very uncertain. All prices are subject to change without notice and higher levels are very probable. The British Government have fixed the maximum price of 18 per cent. tungsten steel at 75c per pound for home trade with slightly higher prices for export. Extras are allowed for certain shapes and sizes. The demand for tool steel has outstripped the output to such an extent that almost fabulous prices are being paid in England for prompt delivery.

The market in the States is strong as ever and prices continue to advance. Orders for bars for munitions show no signs of diminishing, large export orders having being booked recently. Steel bars are now being quoted at 2.25c; tank plates 2.40c and shapes 2.00c Pittsburgh. Billets are scarce and higher. Bessemer billets are now quoted at $33.00 and open hearth billets at $34.00 per ton, Pittsburgh. The ferro-manganese situation is acute and extraordinary prices are being paid for spot ship-

ments, as high as $200 per ton seabord has been offered for prompt delivery ferro-manganese.

Pig Iron

The pig iron situation is unchanged and the market is strong with prices firmly held. There has been an increase in the demand for foundry iron from agricultural implement makers, the prospects for this industry being considerably brighter.

Old Metals

The market is firm with higher prices for all grades of copper and brass. The demand is fairly good for scrap copper but the strength of the copper market is affecting prices of scrap. Prices now range from 1c to 1½c per pound higher. Aluminum is strong and a little higher but lead and zinc are stationary. There is no change in heavy melting steel and wrought iron scrap.

Machine Tools

The announcement that an order for 800,000 shrapnel shells will be at the disposal of the Imperial Munitions Board for distribution among the munition plants has been received with considerable satisfaction in machine tool circles. It is hardly probable that any new plants will be equipped for making shells but a number of new tools will be required from time to time at the munition plants to replace worn out equipment. The depreciation in machinery will be fairly heavy as the plants have been running at high pressure for many months and in the first instance second-hand tools were installed in many cases. Prospects for a steady demand for shell equipment are good but the volume of business will be considerably lighter than it was some time ago. Plants working on shrapnel will no doubt be fully employed during this year unless present contracts are cancelled. The market in the States is more active, domestic munition makers are buying large swing-lathes, while the British and French Governments have reentered the market for lathes for turning large calibre shells. Deliveries from U.S. manufacturers are still backward especially, for screw machines, grinders and milling machines.

Supplies

A number of price changes have been made during this week. Manila rope, transmission rope and drilling cables have again advanced; this time 1½c per pound. The market is very strong on account of the shortage and high prices of raw materials. Higher prices for dry red lead have been announced due to the increase in cost of pig lead. Prices of pure white lead are also higher being now quoted at $10.45 per 100 pounds. Gasoline and benzine are unchanged but the market is very strong and higher prices are looked for in the near future. Lard oil has advanced and is now quoted at $1.28 per gallon. Union thread cutting oil and Imperial quenching oil have also advanced and are being quoted at 54c and 38c per gallon expectively. The linseed oil market is weaker and prices have dropped to $1.02 and $1.05. Turpentine is stationary at 87c per Imperial gallon.

Metals

The metal markets are steady and prices generally unchanged with the exception of antimony which is higher.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

The copper market continues to attract considerable attention but prices are unchanged, although higher in London. The tin market is quiet but the possibility of shipments being lost is helping to keep prices up. Spelter market is quiet but firm with prices unchanged. There is no change in the lead market which continues strong. A scarcity of spot antimony has caused higher prices with a strong market. The aluminum market is firmer but unchanged.

Copper.—The market is strong with supplies of metal scarce for early deliveries. The copper situation is very strong and shows no sign of any change for months to come. The demand for copper for munitions has been, and still is, far greater than was ever anticipated, and if maintained prices will remain at the present high level with the possibility of an advance. Quotations locally are firm and unchanged at 27½c per pound.

Tin.—The market is quiet but firm. The outlook for the market is rather uncertain as the visible supplies continue to increase which would ordinarily lead to a decline in price. There is however the possibility of shipments of tin being lost or restrictions applied, and this is helping to keep prices up. Quotations are firm but unchanged at 45½c per pound.

Spelter.—The market is quiet but firm. There is a heavy demand for spelter from the brass mills but the demand from the galvanizing trade has fallen off owing to the high price. Zinc ore is higher being quoted at $110 to $120 per ton Joplin, Mo. Spelter is unchanged locally at 21c per pound.

Lead.—The market is firmly held, but London is weaker. Lead is quoted locally at 8c per pound.

Antimony.—The market is strong and higher. The spot market is practically nominal on account of the scarcity of metal available for immediate delivery. Antimony has advanced 2c and prices are nominal at 45c per pound.

Aluminum. — There is no improvement in the situation, supplies still being very scarce. The spot market is firmer but quotations are unchanged at 68c per pound.

CANADA SHOULD DEVELOP TRADE WITH RUSSIA

J. D. PRINCE, Ph.D., Professor of Slavonic in Columbia University, New York, speaking in Montreal recently on Russia and her commercial future with reference to the West, stated that Russia needs countless things which Canada could manufacture and send her. For example, there is a great demand for small wares such as pencils, pens, penholders, clocks and watches. She needs marine motors; nets and tackle; manufacturing machines of all sorts and many other such articles too numerous to mention. She requires also tin, iron and other metals as her own mining resources have not yet been properly developed.

This demand Canada has already in some sort discovered. It is not only sheet or pig metal that is needed. They want boiler iron, roofing, babbiting, nails, screws, etc., and thousands of similar products. In other words, here we have an immense country cut off from her chief source of supply—Germany—crying out to you and to us to across the line to feed her with the necessities of civilization.

"Here is a new field open to your great country, and the time to take ad-

vantage of it is now. The two keys to the situation are 1, information, and 2, credit, both of which are yours for the asking. Canada can certainly undertake this new departure and not only increase her own producing capacity, but cement relations with a noble ally who is giving her life blood in the interests of our common humanity."

NEWFOUNDLAND PULP INDUSTRY

MUCH uncertainty is felt at St. John's, Newfoundland, as to the effect of recent war developments on the pulp and paper industry in Newfoundland. When the announcement was made that Sweden had prohibited the export of pulpwood, which had been largely consumed in Great Britain, it was thought that much of the trade might be diverted to mills in the interior of this colony. Soon afterwards, however, it became known that the British Government had put into force more stringent regulations governing importations into England, in order to release more steamers for direct war use.

It is understood that the regulations will apply in part at least, to paper and pulp. In that case, the Newfoundland mills might be forced to curtail their output or shut down entirely.

The largest plant in the colony, controlled by Lord Northcliffe, the London publisher, and his brothers, has a daily output of 200 tons of paper and 50 tons of ground wood-pulp. Four thousand tons of these materials are now awaiting the arrival of a steamer to take them to England. Two smaller concerns, one London-owned and the other operated by Newfoundland capital, manufacture mechanical pulp.

CUSTOMS REVENUE FOR JANUARY

THE Dominion revenue from Customs in January amounted to $10,097,235, an increase of $5,068,027, or more than 100 per cent. over the corresponding month of last year. For the ten months of the fiscal year the Customs collections amounted to $81,818,539, an increase of $17,959,712. These figures, which were issued on Feb. 1, confirm the expectation that the special war taxation would be sufficient to bring the revenues up to the required total.

The financial statement of the Dominion from the beginning of the present fiscal year—namely, April 1st, 1915, to January 31st, 1916—show an increase in revenue from all sources of no less a sum than $30,000,000, as compared with the same period of the previous year. On the other hand, the statement shows that the expenditure on ordinary accounts has been reduced by $11,700,000, and the capital expenditure by the sum of $6,900,000 over those of the same period of the preceding year. Apart from war expenditure, the increase in revenue, on the one hand and the decrease of expenditure on the other show an improvement in the financial position as compared with the previous year of $48,700,000.

Of the increase in revenue $17,000,000 is due to Customs, $3,500,000 to the post office, $8,000,000 to railways and from special war taxes $2,300,000.

LARGE EXPENDITURE ON RAILWAYS

THE Dominion Government expenditures on railways up to the end of the last fiscal year reached the imposing total of $648,075,427.55 and on canals $150,205,770.34, making a grand total of $799,114,181.18. The revenues from railways and canals since Confederation and up to the close of the last fiscal year were $222,183,757.18.

These figures are contained in the annual report of the Department of Railways and Canals, brought down in the House on Feb. 2. The total expenditure on the National Transcontinental Railway for construction is given at $152,802,745.77.

The report does not deal with the operation of the Transcontinental by the Government, as the refusal of the Grand Trunk Pacific to operate the line in accordance with the Laurier contract took place subsequent to the period covered. The total expenditure on the Grand Trunk Pacific mountain section, approved and certified up to the end of March, 1915, is given as $87,119,153, while $15,556,482 was spent on the prairie section up to the end of October, 1907, no further certificates having been issued for this section.

Total Railway Expenditure

The total railway expenditure during the fiscal year to March 31, 1915, was $42,747,532.78, including the outlay on the Quebec bridge construction. This total includes $18,101,809 on the Intercolonial Railway; $1,168,757 on the Prince Edward Island Railway, and $10,071,479 on the National Transcon-

EQUIPMENT FOR AUSTRALIAN NAVAL DOCKYARD

Tender forms and specifications have been forwarded by D. H. Ross, Trade Commissioner, Melbourne, for 43 machines of various types required for the equipment of the Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W. Tenders will be received, subject to the conditions specified, up to May 1, 1916, addressed to the Director of Navy Contracts, Melbourne, Australia. The last mail in time to reach Melbourne on May 1 is that leaving San Francisco on March 22 and due at Melbourne on April 12. The tender forms are open to the inspection of Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer file No. A-1435). Particulars of the requirements are briefly outlined thus:

Three 50-ton overhead travelling cranes.

One 25-ton overhead travelling crane.

Two 5-ton overhead travelling cranes.

One 10-ton revolving cantilever crane.

Two 5-ton travelling portal jib cranes.

Two 7½-ton jib cranes.

One 5-ton jib crane.

Two 15-ton hydraulic cranes.

One 6-ton hydraulic crane.

One 6-ton wall crane (hydraulic).

Two 3-ton wall cranes (hydraulic).

Two electric passenger elevators.

Two electric goods elevators.

One 2½-ton gauge locomotive with crane attached.

One 2½-ton gauge locomotive without crane attached.

Three electrically-driven air compressors, 1,500 cu. ft.

One 15-ton hydraulic winch.

One 5-ton hydraulic winch.

Nine 10-ton hydraulic capstans.

Two 5-ton hydraulic capstans.

One bar shearing machine.

One double-ended horizontal punching machine.

One 10-ton overhead travelling crane for shipyard fitting shop.

tinental Railway. The canal expenditure amounted to $7,314,131.

With the addition of small miscellaneous expenditures, the total outlay for the year on railways and canals amounted to $50,063,988. The revenue derived from Government railways and canals is $12,577,120, including $12,149,357 from railways and $427,763 from canals, the latter being partly a statistical revenue, since the canal tolls were abolished eleven years ago. There was, however, a sum of $236,277 derived from hydraulic and other rents.

The operation of the Intercolonial Railway for the year resulted in a profit of $42,965, a large proportion of which was transferred to equipment renewal account. The total earnings amounted to $11,444,873.

Hudson Bay Road

The report deals with the progress made on the construction of the Hudson Bay Railway and terminals and contains some very interesting photographs of the railway and of the harbor works. It states that navigation during the open season of 1914 was conducted satisfactorily, 36 passages of vessels having been made through the straits without serious accident. The expenditure for the year was $4,773,743, bringing the total up to $10,860,776.

The year's expenditure on the Quebec bridge was $2,816,305, paid out of capital, making the total capital expenditure on the reconstruction of the bridge $7,764,393. The total expenditure by the Railway Department up to the end of the year in connection with this bridge is given as $8,198,748, irrespective of the subsidy of $374,253 paid to the Quebec Bridge Company and of the sum of $6,975,266 paid for the guaranteed bonds of that company.

Dealing with the Welland Ship Canal, the report states that the expenditure for the year was $4,074,200, making a total of $5,068,458, plus the sum of $187,238 for preliminary surveys and borings. Railway subsidies for the year amounted to $5,191,507.

ONTARIO TIMBER PRODUCTION

STATISTICS of timber production on Crown lands in Ontario, and of the revenue, etc., during 1915 and 1914 are as follows:

Pine sawlogs, square timber, etc.; 1915, 407,874,044 ft. b.m.; 1914, 382,582,027 ft. b.m.

Sawlogs, etc., other than pine: 1915, 59,308,403 ft. b.m.; 1914, 77,451,857 ft. b.m.

Pulpwood: 1915, 301,061 cords; 1914, 104,544 cords.

Ties: 1915, 729,164; 1914, 5,439,845.

Area under license: 1915, 15,712 square miles; 1914, 17,333 square miles.

Revenue: 1915, $1,629,640.60; 1914, $2,009,122.43.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Galt, Ont.—An electric motor will be purchased for the pumping station.

Brantford, Ont.—Fire at the American Radiator Co. plant here on Feb. 4 did $1,000 damage.

Millbank, Ont.—H. E. Ratz & Co., is in the market for a 50 h.p. Wheelock or Corliss engine.

Chatham, Ont.—The Gray-Dort Motor Co., are equipping a plant here for making motor cars.

Ailsa Craig, Ont.—William Hay is in the market for electrical machinery for mill installation.

Toronto, Ont.—The Hamilton Carburetter Co., will make an addition to their factory on Queen street.

Hespeler, Ont.—Fire last Saturday destroyed part of the A. B. Jardine & Co. factory. The loss is estimated at $75,000.

Toronto, Ont. — Campbell's Flour Mills, Ltd., are in the market for a 2-phase 60-cycle 220-volt motor, about 20 horse power.

Vancouver, B.C.—The Pumps & Power Co. is in the market for drill presses, a 25 or 50-h.p. direct current motor, and a complete switchboard.

South Porcupine, Ont.—Tisdale Township Council will purchase a high-pressure, electrically-driven fire pump to cost about $5,000. W. H. Wilson is the clerk.

Montreal, Que.—The Canadian Architectural Iron Works, Bellechasse street, were totally destroyed by fire recently. The machinery will probably be a total loss.

Peterborough, Ont. — The premises formerly occupied by the Canadian Cordage Co. will be taken over and equipped by the Peterborough Metal Products Co.

Toronto, Ont.—A building permit has been issued to the Toronto Laundry Machine Co., for the erection of an addition to the factory. The cost is estimated at $2,800.

Brussels, Ont.—The Cardiff & Dames Co. are in the market for a gasoline motor, rock crusher, pulverizing machinery, and considerable other equipment for the manufacture of limestone fertilizer.

Welland, Ont.—The Canadian Steel Foundries, Ltd., will spend $100,000 in improving their plant here. A 35-ton open-hearth furnace will be installed, and the rolling mills will be overhauled.

Three Rivers, Que.—W. Paquin, 318 St. Julie Street, is inquiring for wood-working machinery, steam boilers, hoisting apparatus and other miscellaneous shop equipment.

Quebec, Que.—The Ross Rifle Co. has contracts to give out to manufacturers of small work, such as sewing machines, telephones, phonographs, typewriters, etc.

Thorold, Ont.—The Ontario Paper Co., will erect a sulphite mill with a capacity of fifty tons per twenty-four hours. There will be two digesters, each 15 feet in diameter by 49 feet in height installed.

Calgary, Alta.—It is reported that the Ford Motor Co. has purchased a site 500 by 130 feet on C. P. R. trackage for an assembling plant to be erected here. The building will be four storeys high.

Durham, Ont.—The National Portland Cement Co. contemplates extensive changes in its plant, and will be in the market for a large quantity of machinery. W. Calder, Durham, Ont., is plant manager.

Sarnia, Ont.—The Union Natural Gas Co. have decided to relay the pipe line from Tilbury to Sarnia, a distance of 57 miles. The pipe will be of steel, 10 in. diameter, and the cost is estimated at $300,000. Work will begin in the spring.

Municipal

Ridgetown, Ont.—The Town Council contemplate making extensions to the waterworks system.

North Vancouver, B.C.—The city council may purchase motor driven hose wagons.

Berlin, Ont.—The Council have given the by-law to guarantee the bonds of the proposed Hydro radial railway line from Toronto to London to the amount of $774,000 its third reading.

Hay Township, Ont.—A by-law will be voted on to raise $1,768 to provide a hydro-electric distribution system.

Port Dover, Ont.—A filtration plant will probably be installed here. James. Loudon & Hertezberg, of Toronto, are the engineers.

London, Ont.—The proposed extensions to the waterworks system will be commenced shortly. A large number of hydrants will be required.

Stephen Township, Ont.—The Township Council propose spending $1,632 on a hydro-electric distribution system. A by-law will be submitted to the ratepayers on February 14.

General Industrial

Niagara, Falls, Ont.—The Oneida Community Co., propose building a factory here.

London, Ont.—The city council are in the market for transformers and other electrical equipment.

Sandwich, Ont.—The Cadwell Sand & Gravel Co. will construct a factory here at an estimated cost of $50,000.

Vancouver, B.C.—The American Car Co., will build an addition to their factory here, estimated to cost $70,000.

Stratford, Ont.—A. J. Bates, of the McConkey-Bates Co., proposes to build a factory for the manufacture of corrugated iron.

Vancouver, B.C.—The Vancouver Creosoting Co., Ltd., will build a plant there to cost $150,000. J. B. Johnson is interested.

Sarnia, Ont.—The Board of Trade is negotiating with the Wallaceburg Woollen Mills with a view to having that concern sold to local interests.

Brockville, Ont.—Fire on Feb. 7 destroyed the Roebuck Cheese Factory, together with a new box factory located at Roebuck near here. The loss is only partly covered by insurance.

St. Johns, Nfld.—The Harmsworth paper plant at Grand Falls, which supplies the newspapers owned by Lord Northcliffe, was the scene on Feb. 2, of a fire which destroyed thousands of cords of barked wood. The probable loss was estimated at $100,000.

London, Ont.—Plans are being prepared for enlarging the plant of the Parnell Steam Baking Co., and installing new machinery. Estimated cost, $50,000. E. Parnell, Bruce Street, is manager.

Berlin, Ont.—A. J. Kimmel has resigned the presidency of the Canadian Consolidated Felt Co., and has purchased the Cobourg Felt Mills and shoe plant, located at Cobourg, Ont. This company has a share capital of $200,000, all of which was purchased by him.

Contracts Awarded

Montreal, Que.—The Montreal Tramways Co., have awarded a contract for boilers to the Babcock & Wilcox Co., and for a steam turbine and generator to the Canadian General Electric Co.

Toronto, Ont.—The Board of Control has awarded to the American La France Fire Engine Co., the contract for two six-cylinder tractors for the hook and ladder trucks at $6,127 each, and one six-cylinder tractor for the aerial truck at the same figure, a total amount of $18,381.

Tenders

Ottawa, Ont.—Tenders will be received until Feb. 29, for the supply of waterworks materials for this year. Particulars can be obtained from R. L. Haycock, waterworks engineer.

Montreal, Que.—The Board of Control have decided to call for new tenders for a supply of 6,000 tons of asphalt, replacing the former call, which was illegal, due to a mistake in the preparation of the advertisement. Tenders close on March 2.

Calgary, Alta.—Tenders will be received by the city commissioners up to Monday, February 14th, for the manufacture and delivery of switch board equipment. Specifications with the city electrical engineer, City Hall.

Toronto, Ont.—Tenders for lead covered cable, addressed to the chairman, the Toronto Electric Commissioners, will be received until Wednesday, February 16, 1916. Specifications and form of tender can be obtained at the office of the purchasing agent, 15 Wilton avenue.

Toronto, Ont.—Tenders for pole type transformers, addressed to the chairman of the Toronto Electric Commissioners, will be received until Wednesday, February 16. Specifications and form of tender can be obtained at the office of the purchasing agent, 15 Wilton avenue.

Montreal, Que.—Tenders will be received by the Board of Control until Feb. 15, for the construction of a building and supply and installation of a pump. Particulars may be obtained from the office of the engineer superintendent of sewers, City Hall.

Ottawa, Ont.—Tenders will be received by R. C. Desrochers, secretary, Department of Public Works, Ottawa, up to Tuesday, February 15th, for the supply of: Brooms and brushes, chain, coal, hardware, hose, oils and greases, packing, paint and paint oils, Manila rope, wire rope and steam pipe, valves and fittings, for the requirements of the Departmental Dredging Plants in Manitoba, New Brunswick and Nova Scotia, during the fiscal year 1916-1917. Tender forms may be obtained at the Department of Public Works, Ottawa.

Ottawa, Ont.—Tenders will be received until Monday, February 28, 1916, for the construction of timber lock gates and their equipment for the East River Lock, near New Glasgow, Pictou County, N.S. Plans and forms of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the district engineers at Antigonish, N.S.; Halifax, N.S.; Shaughnessy Building, Montreal, P.Q.; Confederation Life Building, Toronto, Ont., and on application to the Postmaster at New Glasgow, Nova Scotia.

Hamilton, Ont.—Tenders will be received up to Wednesday, March 1st, 1916, for supplying the corporation of the City of Hamilton, with the following:—Castings (ordinary and special), iron pipe, hydrants, valves, extension boxes, lead pipe, pig lead, rubber hose, rubber boots, road oil, lubricating oil, flux, fuel oil, coal oil, gasoline, concrete and garbage duck covers, bass brooms, sectional sweepers, brass work, including ordinary and special brass castings for water department, hardware. Specifications and form of tender for all of the above can be obtained at the office of the city engineer, Hamilton, Ont.

Departmental Dredging Plant.—Separate sealed tenders addressed to R. C. Desrochers, secretary Department of Public Works, Ottawa, will be received until February 15, 1916, for the supply of brooms and brushes, chain, coal, hardware, hose, oils and greases, packing, paint and paint oils, Manila rope, wire rope, steam piping, valves and fittings, for the requirements of the Departmental Dredging Plant in Ontario and Quebec during the fiscal year 1916-1917. Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures. These forms can be obtained at the Department of Public Works, Ottawa.

Montreal ,Que.—Under the direction of the Hon. the Minister of Militia and Defence, certain condemned stores as follows:

Bunting	10 lbs.
Old canvas	750 "
Old leather	4,540 "
Old linen	2 "
Old brass	1,901 "
Old Copper	9 "
Wrought iron	15,687 "
Scrap steel	116 "
Steel files	2 "
Cotton rags	145 "
Woollen rags	4,491 "
Old rope	383 "
Rubber	1,900 "
Ground sheets	270 "
Old tentage	907 "
Brass buckles, ⅞"....	19,500 "
Brass buckles, ¾"....	18,500 "

in possession of the Senior Ordnance Officer, No. 4 Division, Montreal, are for sale by public tender. The above stores may be seen on application to the Senior Ordance Officer, 66 St. Paul St., East Montreal, any day between the hours of 10 a.m. and 4 p.m., Saturdays and Sundays excepted. Sealed tenders for the purchase of any or all of the lots, addressed to the Senior Ordnance Officer, at the above address, will be received until February 15, 1916.

Railways—Bridges

Brantford, Ont.—The L. E. & N. Ry. started its service between Brantford and Galt last Monday without formalities.

Edmonton, Alta.—It is proposed to build a railroad between Athabasca and Fort Vermilion. The Hon. A. B. McKay of Edmonton, is interested in the proposition.

Marine

St. John, N.B.—The fog alarm station at Cape Spencer has been destroyed by fire, involving a loss of $6,000.

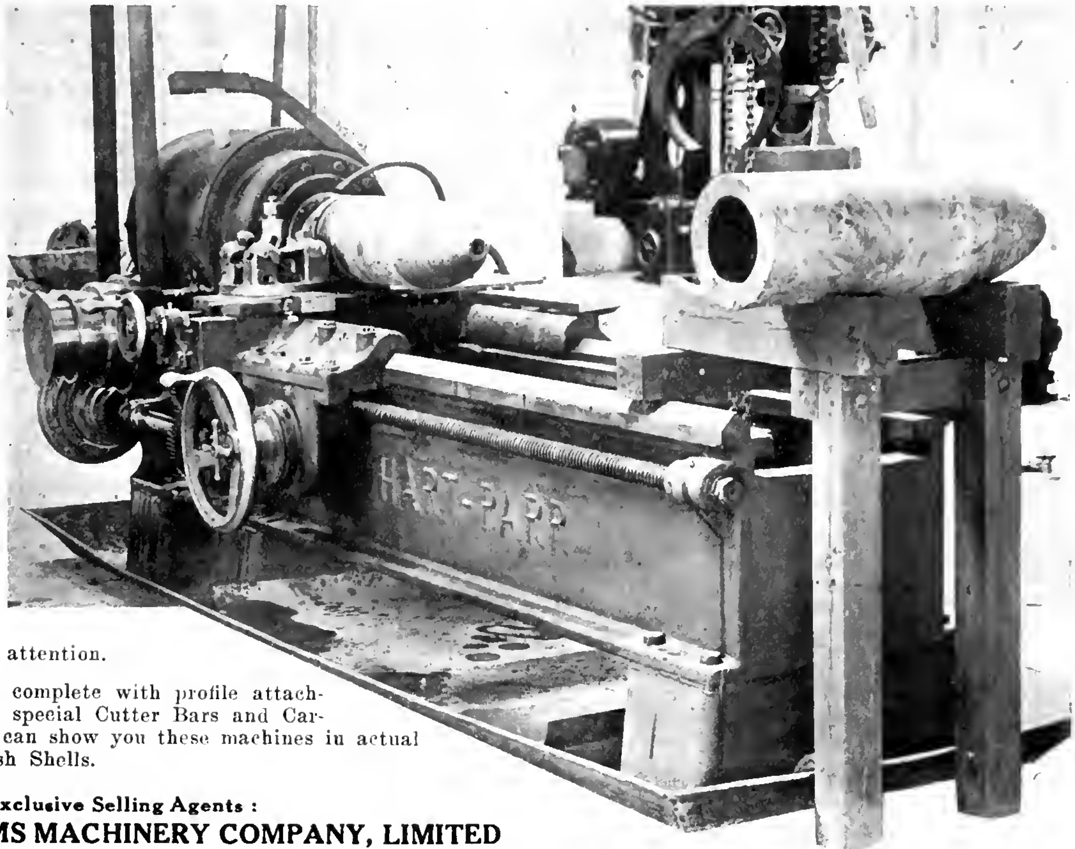
St. John's Nfld.—W. F. Coaker, of this city is considering the establishment of a shipbuilding plant at Catalina, on the north coast of Newfoundland The intention is to revive the shipbuilding industry which was at one time prosperous.

Wood-Working

Oakville, Ont.—Wallace, Chapman & Marshall will establish a factory for the manufacture of boxes, baskets, etc.

HART-PARR LATHE

for producing SHELLS from 6 in. to 9 in. diam.



This tool possesses enormous stiffness and great durability, and is wonderfully easy to control.

It has the accuracy that's so highly essential in the manufacture of munitions, and requires very little attention.

Fitted up with tooling complete with profile attachments for turning, and special Cutter Bars and Carriages for boring. We can show you these machines in actual operation on 9.2" British Shells.

Exclusive Selling Agents :

The A. R. WILLIAMS MACHINERY COMPANY, LIMITED

TORONTO, CAN.

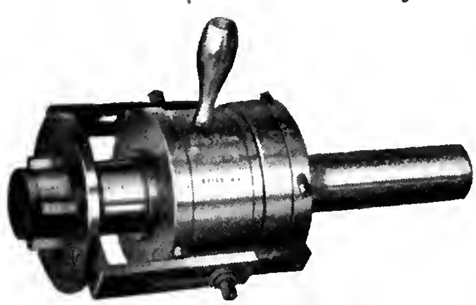
WHAT REASON HAVE YOU

For not using a Geometric Collapsing Tap in tapping out holes above ¾-inch diameter? **Your rate of production would be increased, and your cost of production decreased.**

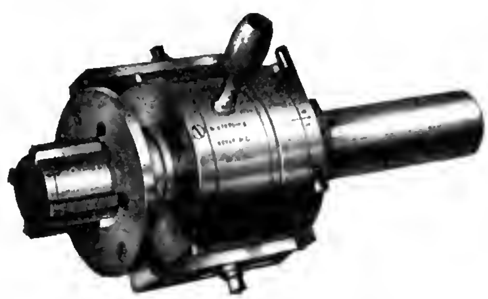
Geometric Collapsing Taps require no backing out over the threads. They are rigid while cutting, but collapse their chasers at the prescribed depth of thread.

It makes no difference what the thread is, a Geometric Collapsing Tap can be furnished that will produce it

to your entire satisfaction.



Geometric Collapsing Tap Arranged for Plug Bottoming.



Geometric Collapsing Tap Arranged for Tapping.

We will fit the tap with whatever size shank your machine requires. Send specifications of your work, and our experts will make a study of it and tell you what we can do for you. Look over our catalogue. Get in touch with us, at least.

The Geometric Tool Company, New Haven, Conn., U.S.A.

Canadian Agents:

Williams & Wilson, Limited, Montreal   The A. R. Williams Machinery Company, Limited, Toronto, Winnipeg St. John, N.B.

Calgary, Alta.—The sawmill owned by the Riverside Lumber Co., at McGillivray, B.C., which was totally destroyed by fire with a loss of $65,000, will be rebuilt.

Prince Rupert, B.C.—T. M. Michaels and F. J. Burling plan the construction of a modern wood-working plant in this city. A sawmill will also be erected in the early spring at Port Simpson, B.C.

Building Notes

Montreal, Que.—The Northern Electric Co., will make an extension to their factory.

Woodstock, Ont.—The Standard Wire Fence & Tube Co., will build a new warehouse to cost $1,000.

New Incorporations

The Manitoba Steel Foundries, Ltd., Winnipeg, has been incorporated with a capital stock of $100,000 by P. J. Smith and others to manufacture machinery, steel, etc.

The Lyman Tube & Supply Co. has been incorporated at Ottawa, with a capital of $180,000, to carry on business at Montreal, Que. Incorporators: Charles P. Lyman, Lawrence Macfarlane and William B. Scott, all of Montreal.

The Pembroke Ironworks Ltd., has been incorporated at Toronto with a capital of $100,000 to do a general foundry and machine shop business at Pembroke, Ont. Incorporators James F. Munro, William F. Fenton and Thomas Pink, all of Pembroke, Ont.

The Perkins Glue Co. has been incorporated at Ottawa, with a capital of $40,000, to manufacture vegetable and other glues at Hamilton, Ont. Incorporators: James G. B. Perkins, Hugh J. McKenna, and L. F. Stephens, all of Hamilton, Ont.

The Canadian Rock Drill Co. has been incorporated at Ottawa, with a capital of $50,000, to take over the Canadian business of the Denver Rock Drill Mfg. Co. The head office is at Toronto, and the incorporators are Walter J. Boland, John F. Boland, of Toronto.

The Ontario Machine Co. has been incorporated at Ottawa, with a capital of $100,000, to carry on business as mechanical engineers, iron founders and manufacturers of munitions. The head office is at Toronto, and the incorporators are William G. Smart, James Chisholm, and Thomas B. McQuesten, all of Hamilton, Ont.

The St. Clair Oil Refining Co. has been incorporated at Ottawa, with a capital of $250,000, to carry on business as refiners, with head office at Toronto, Ont. Incorporators: J. E. Stanton, of Raglan, Ont.; T. H. Hamilton, of Toronto, and W. R. Mather, of Stirling, Ont.

Machine & Stamping Co., has been incorporated at Toronto with a capital of $100,000 to carry on business on wood and metal products. Head office to be at Toronto and the provisional directors are Kenneth F. McKenzie, William H. Cook and Arthur L. Reid all of Toronto.

Advance Engineering Co. has been incorporated at Ottawa, with a capital of $20,000, to carry on business as consulting and operating engineers, chemists and contractors. The head office is at Toronto, and the incorporators are Howard S. Ross, Eugene R. Augers and Henry M. Gardner, all of Montreal, Que.

EQUIPMENT REQUIREMENTS OF VICTORIAN RAILWAYS

Tender forms with reference to the following materials required by the Victorian Railways, Melbourne, have been forwarded to the Department of Trade and Commerce, Ottawa, by D. H. Ross, Trade Commissioner, Melbourne:

Copper plates for engines.

Brass locomotive boiler tubes for maintenance.

Brass locomotive boiler tubes.

Locomotive seamless copper tubes for engines.

Solid drawn steel tubes for engines.

Copper or alternatively steel flue tubes for engines.

It is stated that the chief storekeeper's department of the Victorian Railways are at "their wits end" in the matter of securing the above materials. The question of price does not now enter into consideration, and it is entirely a question of obtaining supplies, as the completion of a number of locomotives depends entirely on whether the necessary materials can be obtained. The authorities state that if any difficulty is experienced in getting prices to the conditions as printed they will be glad to have submitted to them the best offers obtainable, since they are very desirous of doing business with Canada. Particulars should be forwarded by letter by the earliest mail, or by cable for preference (cable cypher, "Railways, Melbourne"). Canadian firms interested, on application to the Department of Trade and Commerce, Ottawa, may inspect any of the above contracts for which they are prepared to tender. (Refer File No. A-1919.)

Personal

The Hon. Francis Cochrane, Minister of Railways and Canals, has returned from Europe.

J. A. Cunningham, president of the British Columbia Manufacturers' Association, has left Vancouver on a trip to Eastern Canada.

W. G. Trethewey was appointed resident engineer of West Dome Consolidated, at a directors' meeting held recently.

J. H. Mead, formerly vice-president of the Lake Superior Pulp Co., it is reported has been appointed president of the Spanish River Pulp & Paper Mfg. Company.

Canadian Society Civil Engineers.—The new officers of the Canadian Society of Civil Engineers for the coming year are as follows: President. G. H. Duggan, vice-president and general manager, Dominion Bridge Co., Montreal; vice-president, T. H. White, chief engineer, C. N. R., Vancouver; councillors, J. R. W. Ambrose, chief engineer, Toronto Terminals Railway Co., Toronto; H. Donkin, deputy minister, Department of Works and Mines, Halifax; A. E. Doucet, Quebec; W. J. Francis, consulting engineer, Montreal; E. D. Lafleur, chief engineer, Department of Public Works of Canada, Ottawa; D. O. Lewis, district engineer, C. N. R., Victoria; D. A. Ross, consulting engineer, Winnipeg; H. R. Safford, chief engineer, G. T. R., Montreal.

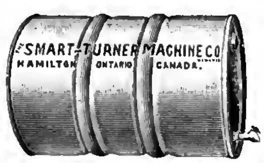
Trade Gossip

The Imperial Munitions Board propose erecting a factory at Verdun, near Montreal, for loading shells.

The Crescent Belt Fastener Co., Toronto, A. G. Walker, manager, have moved from 28 Wellington West to larger offices at 32 Front Street West.

C. B. Owens, of the Canadian Powers Regulation Co., of Toronto, has taken over the agency for the "Tuec" vacuum cleaner, until recently handled by James Y. Martindale.

Trade Enquiries.—The Department of Trade and Commerce, Ottawa, has received enquiries from England, for the following: — (1281) Large forgings.



Page 56 contains something that will interest you. Turn to it.

(1282) wagon tires and axles; (1283) high quality forgings, (1284) railway wagon springs.

Tool Steel Demand.—Arising out of the abnormal demand for tool steel, the Vanadium Alloys Steel Co. of Pittsburgh, whose plant is located at Latrobe, Pa., are installing an additional 30-pot crucible furnace.

More Shrapnel Ordered.—We understand that a further order for eight hundred thousand 18-pdr. shrapnel shells has been placed with the Imperial Munitions Board at Ottawa, on behalf of the British Ministry of Munitions. Indication of the foregoing was given in our editorial of February 3.

J. A. Cunningham, president of the B. C. Manufacturers' Association, believes that it would be in the best interests of the manufacturers of Manitoba, Alberta, Saskatchewan and British Columbia, and also the consumers for these provinces, to form a Manufacturers' Association of their own.

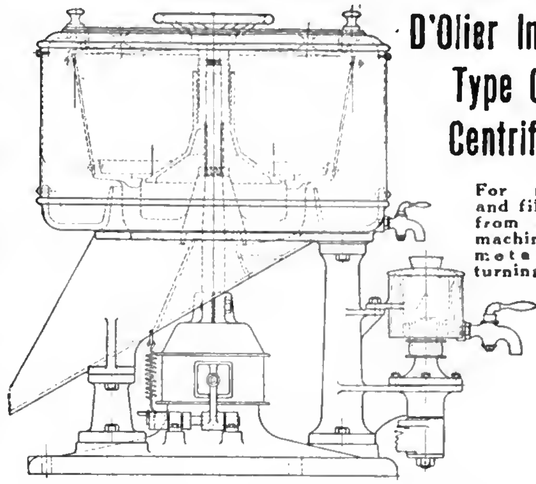
The International Nickel Co., of New York, has covenanted with the Dominion Government to establish somewhere on the Atlantic seaboard a plant for the refining in Canada of all the nickel necessary to secure to Great Britain and Canada their full requirements of the metal vital to defence purposes.

Northport, B.C.—The Northport smelter, being constructed by the Northport Smelting & Refining Co., financed by the Hercules and the Tamarack & Custer Mining Companies, will be ready to blow in March 1, according to H. V. Croll, of Allentown, Pa., sales engineer for the Traylor Engineering Co.

Railways Building in Alberta.—During 1915 there were 326 miles of new railway constructed in Alberta, or more than in all the other western provinces combined. The new mileage is credited to the various companies as follows:

Canadian Pacific Railway	22
Canadian Northern Railway	59
E., D. & B.C.	97
A. & G. W.	100
Central Canada Railway	48
Total	326

Public Works Expenditures. — The estimates for the year include $1,000,000 for St. John, N.B., harbor, and for harbor and river improvements at Fort William and Port Arthur, Ont., $1,000,000. Other large votes are Halifax dry dock, $250,000; Quebec harbor improvement, $490,000; Quebec dry dock, $1,500,000; improvements to navigation in Quebec harbor, $700,000; Toronto harbor improvements, $600,000; French river waterways improvements, $400,-



D'Olier Improved Type Chip Centrifugal

For recovering and filtering oil from automatic machined parts, metal chips, turnings, scrap, etc.

A large capacity, extremely efficient machine, especially designed and built to care for the "rush" character of work and the increasing volume of shop output now prevailing.

SPECIAL FEATURES

Weston type, self-balancing basket, 30 in. diameter, motor driven.

Bottom chute discharge and conical unloading valve.

Centrifugal oil filter attachment.

The 30" Weston type self-balancing basket, which is the largest capacity for this service, is of the non-removable type. No service (removable) baskets are required for this machine, the load being dumped into the operating basket and discharged by means of our special conical unloading valve and chute, which is a great time-saving feature.

The centrifugal oil filter, with which the machine is equipped, is operated by the main driving belt, the complete unit being therefore self-contained, simultaneously recovering and filtering the oil from the chips, turnings, etc.

D'Olier Centrifugal Pump and Machine Co.

Morris Building, Philadelphia, U.S.A.

BETTER DO IT RIGHT AWAY

Consider them on your work.

BAKER DRILLS

They are POPULAR tools on Lyddite and Shrapnel.

POPULAR because they produce ACCURATE—DEPENDABLE work at extremely low labor cost, low installation cost and small floor space.

SHELL OPERATIONS

READILY PERFORMED BY **BAKERS**

Drilling, Boring, Reaming, Counterboring, Facing, Undercutting, Nosing, Tapping.

BAKER BROS., Toledo, O., U.S.A.

Sales Agents;
The A. R. Williams Machinery Company
Toronto, Ont.

000; Vancouver harbor improvements, $350,000; Victoria harbor improvements, $1,000,000, and Esquimalt dry dock, $200,000.

Catalogues

Concerning High Speed Steel.—The Vanadium Alloys Steel Co., Pittsburg, Pa., have issued a folder with the above title which contains a statement regarding the high speed steel situation with suggestions for the guidance of users of this material. The folder refers briefly to "Red Cut Superior" and "Red Cut Cobalt" grades of high speed steel.

Hydraulic Presses.—The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, are distributing two bulletins No. 5004 and No. 5005 dealing respectively with a 1,000-ton and an 800-ton hydraulic press. Bulletin No. 5004 illustrates and describes a 1,000-ton press for heading brass cartridge cases. Bulletin No. 5005 shows a 700-ton hydraulic press which was built for the Prest-O-Lite Co. for cupping and drawing dissolved acetylene cylinders. A brief specification is given of this press and method of operation described.

Recording Thermometers.—The Bristol Co., Waterbury, Conn., are distributing catalogue No. 1300, illustrating and describing Bristol's class 3, recording thermometers for temperatures between 60 degrees below zero and 800 degrees Fahr. Various methods of application are briefly described and illustrated while a number of specimen charts for the recording thermometers are shown. The catalogue also shows a number of bulbs and connections for the various applications of the thermometers, while complete price lists are included for all the various types and sizes of thermometers.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, FEBRUARY 17, 1916 No. 7

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY

PETER BAIN, M. E., Editor.

Associate Editors.

A. G. WEBSTER. J. M. WILSON. J. H. RODGERS.

B. G. NEWTON - - - - - - Advertising Manager

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—London, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 140 So. Dearborn St., Room 607, Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Opportunities for Canada's Industrial Development-III.

By C.T.R.

In this series of articles prepared in response to numerous inquiries received from the managements of Canadian metal-working plants on the subject of post-bellum employment for their added equipment and enlarged capacity arising from an extended period of shell production, we aim to give prominence to the opportunity to manufacture such products as were previously imported for our domestic needs or have since become available for export.

THE formulation of plans regarding after-the-war commercial operations is, next to the war itself, probably the most universal subject of discussion at the present moment. Quite apart from the fact that the war may last three months or three years, the manner in which civilization will adjust itself as former conditions return, is causing not a small amount of speculation, much of it hopeful, but some of it not unmixed with apprehension.

Circumstances over which people have no control may force them into a war, rapidly and unexpectedly, but the successful completion of the reverse process after the termination of hostilities will be entirely dependent on the people of the various nations.

Success Depends on Preparedness

The history of events up to and since the outbreak, has convinced the British nation of the value, not only of preparedness, but of national organization and just as we appreciate the latter fact, so will we be able to derive any benefit from the struggle.

The great increases of German trade in the years preceding the war were directly due to commercial organization just as her advances at the beginning of the war were due to military preparedness. Science, in the form of engineering, has been the mainstay of our foe's efforts, and, as so many of us know, just as our own engineering resources have been organized so has our offensive power increased.

Engineering Industry a National Asset

That a sound and prosperous engineering trade is a national asset of great value in time of war is apparent to all. Speaking in the House of Commons on December 20th last, Mr. Lloyd George said:

"In no war ever fought in this world has the preponderance of machinery been so completely established. . . . The problem of victory is one of seeing that this superiority of the Central Powers shall be temporary, and shall be brought to an end at the earliest possible moment. There is one production in which the Allies had a complete mechanical superiority, and there they are supreme—that is, in the navy. Our command of the sea is attributable, not merely to the excellence of our sailors, but to the overwhelming superiority of our machinery."

The Canadian public, no less than the British has been awakened to the important position occupied by the engineering industry, and the widespread interest in its future prospects may well justify the hope that the combined efforts of all parties concerned will be directed to maintaining, strengthening, and ultimately extending the present manufacturing capacity of this country.

Preservation a National Duty

Commenting on this aspect of affairs the Engineering Review remarks . . "It is impossible to draw a line dividing those sections of the metal and machinery trades which can be classed as armaments and those which are, and always will be devoted to purely peaceful industry. For the war has proven that when a great Power enters into a quarrel, the thing that will count for most, both in diplomacy, and if necessary on the battlefield, is its powers of producing weapons and munitions, and that means, in effect, its total possible production, counting in every mechanical workshop within its borders. . . . But we have no experience of political manoeuvring for some years past to justify us in expecting that the Government or any powerful parliamentary group will make it their business to give special attention to the permanent protection of our means of national salvation. Therefore, it devolves upon the men who know and the men whose lifework is concerned with the production of metals and machinery to enter upon a campaign of education. . . . That is to say, it should be somebody's business, and obviously the business of the engineering industry itself, to keep hammering away at the general public, and to make the people understand, firstly, that we owe our national preservation to the engineering industry; secondly, that long before the war our enemies had entered upon a deliberate campaign unfavorable to this industry, thirdly, that this campaign will almost certainly be renewed after the war, and fourthly, that the nation cannot afford to leave the industry unguarded against such machinations."

These remarks apply to Canadian industry equally as well as to British, with the important difference that results as affecting this country had not yet become so obvious or ominous. The distance separating this country from Europe was a large factor in delaying the commercial offensive against us, but the same fact is so much more in our favor as regards future development. Canada's comparative immunity from military disturbance, the available sources of raw material, both at home and in neighboring States, cheap power supply in the manufacturing districts, and facilities for shipment to all parts of the world are, or should be potent factors in the development of an overseas trade in the not far distant future.

Desirable Foreign Markets

The foreign markets which might appeal directly to engineering manufacturers at the present moment are the British possessions and Russia. Latin America comprising the South American Republics has figured largely in American journalism, but certain features of the situation there are such that Great Britain will more than recover any temporary set-back, after removing the menace.

As a general statement without regard to any one market, the main features to be considered by a firm contemplating export trade are these—Does a demand exist for its product; if not, can it be created and if so, how? Are the resources of the firm such that it can finance the business on the conditions obtaining in the market? Presuming that the two foregoing points can be satisfactorily answered, it remains to be seen whether it is commercially feasible in view of freights, tariffs, and manufacturing costs to establish a permanent profitable business.

Individual Investigation Desirable

The answer to all of these questions must be sought by the manufacturer himself. No generalisation of statements can possibly take the place of, or equal in results obtained, a personal investigation by an interested party. The cumulative effect of numerous investigations of such a nature would result in a gradual absorption of export requirements by the trade generally, so that as worldwide commerce gradually resumed its former proportions a greater number of our manufacturers would be pepared to enter the field.

The Lure of Russia

Because of its vastness and huge population, Russia has had a peculiar fascination for students of political economy, and it is doubtful if the economic effects of the war on any one people in its relations to the rest of the world will be so marked, except, of course, adversely in the case of Germany. Writing from Petrograd in May, 1915, Mr. C. F. Just, Special Trade Commissioner, gives a lengthy report from which the following extracts are taken as being of particular interest to our manufacturers at this time:

"It is doubtful whether any conceivable scale of waste and destruction of life in the present war on the side of Russia will affect the country's economic position for any appreciable period if the past be any reliable guide in such matters. The recuperative power of Russia has invariably proved equal to every call. She has tried with impunity, economic experiments which would have seriously affected most other countries. Wars and political and social upheavals have seemingly had but little effect.

Russia internally is rich and prosperous: her national resources are very great and of infinite variety, her present population of 171,000,000, however backward and inefficient, is nevertheless being slowly raised and educated, and constitutes an important factor in the production of wealth. Apart from agriculture, in which 75 per cent. of the population is engaged, the manufacturing and mining industries, though very considerable within a restricted range of production, furnish an insignificant output in relation to the country's actual needs. For this position the lack of the spirit of enterprise among the native Russian capitalists is said to be responsible. On the other hand, liberal provision for the education and training of skilled men for modern industrial conditions is being made.

Unusual Nature of Opportunities

There is to be found in Russia, therefore, the unusual conditions of great opportunities for industrial enterprise for which the consuming power is at hand, side by side with opportunities for imports on an extensive scale, with the certainty that the former will rather stimulate than retard the growth of the latter, both in variety and extent: for with the slightest rise in the standard of comfort of such a large population the home industries can hardly expect to meet the demand, at least not for a number of years. Primarily, these factors should make Russia a great market, and if the conditions be rightly studied and understood Canadian manufacturing industries by the nature of their products which are adapted in so many instances to the requirements of a developing country like Russia, may reasonably expect to participate in the trade with that market."

The conditional statement in the last sentence of the foregoing extract is the pivot around which much discussion will inevitably develop and compliance with it is an essential factor in success in any line of business. No work of any kind can be profitably undertaken if it be not rightly studied and understood. Mr. Just studied the Russian situation on the ground, and his remarks on German trade with Russia indicate what sort of study and understanding is desirable.

Trade Methods and German Success

"The experience and success of Germany during the last 25 years in building up the trade position which she occupied in Russia at the outbreak of the war, when she had 52 per cent. of the import trade to her credit, has demonstrated the soundness and capacity of the market. The success of Germany has been principally due to enterprise based upon a thorough understanding of local needs and backed by efficient organization.

"Financial support from the German banking institutions, which are so largely interested in German industries, have no doubt also greatly facilitated the German invasion, notably in the granting of long credits, and in securing important contracts. On the whole, however, it should be admitted that German enterprise and organization have been the chief determining factors in her success. . . . In reply to inquiries as to the best way in which Canadian trade may be furthered, the advice has invariably been 'Follow the example of Germany and it will bring success to yourselves,' in short, Canadian traders should organize on the basis of a close, intelligent, personal study of the requirements of the Russian market, and supply those needs on the terms and conditions demanded by the local customs. Most important of all, they should arrange to keep in touch with the consumer through a local house or agent, so that they may always know how their goods are suiting, and how they might be varied or improved under changing conditions. They should remember that the consumer is the best teacher, and that they can also learn from him information concerning their competitors which it is important to know. One may safely give credit and large credit in Russia, but there is no country where the granting of credit calls for greater discretion, or where, when it is granted under such conditions it is likely to be safer. The highest authorities in the banking and commercial world in Petrograd are unanimous on this point."

The complete report is lengthy and has been published in detail by the Department of Trade and Commerce, and a close study and consideration of the entire situation will enable many manufacturers to decide whether to supplement the conclusions by further personal investigation.

That the matter should be taken up by a group of suitable manufacturers in preference to individual effort is evident from the following particulars regarding actual conditions to be met.

How to Trade With Russia

"The conditions of the Russian market differ from that of every other European country in that the expenses of initiating and conducting business are relatively excessive. The general opinion of independent authorities, including leading bankers in Petrograd, is that Russia is no place for the single firm which desires to run independently, as to do so in all probability would be to court failure; unless always their particular articles were likely to be of universal use, and to command such a sale as to make the initial expense a matter of indifference. Another factor against the small single firm is that Russia when she once buys, buys on a large scale. The authorities on the question, therefore, advocate the plan of associated groups, or syndicates of powerful firms whose products do not compete, but are complementary to each other. Syndicates of this class entering the market have the best prospects of success. Obviously, under these conditions the incidence of the expenses for each participator would be considerably lighter in every direction, and the work of building up an efficient organization in the chief centres would be greatly facilitated. This is the German plan of approach and has justified itself in a number of instances, having been of great assistance generally in advertising German industrial products in Russia."

Assembling and Auxiliary Works

"In the case of the import of bulky articles like machinery, special and general, for which Russia is such a promising market, particularly machinery with heavy structured sections, or parts which could be obtained, finished and fitted locally in Russia, the question of an assembling shop or auxiliary works is one that could, and indeed should receive serious consideration from a syndicate of firms as mentioned. This feature is of importance to firms of distant countries like Canada. In the first place as the Russian duties are high, and are levied on weight, the saving in duty and freight and handling would be considerable, and would assist in meeting local or foreign competition; secondly, the setting up in the country of a quasi-permanent establishment employing

Russian labor and Russian material would not only give local satisfaction, but favorably dispose the Russian authorities, in the event of the firm tendering for Government contracts. It should be remembered that under the Russian administrative system the Government is easily the first purchaser in the country, and is permanently in the market."

The following list (table 1) has been abstracted from a list of goods manufactured by German firms, and now in demand in Russia, having been compiled from recent reports received from the British consular officer in that country. The items are selected either because they are at present produced by Canadian firms, or are adaptable for production as additional lines in existing factories:

U. S. TUNGSTEN ORE OUTPUT IN 1915

THE tungsten ore output of the United States in 1915 is placed by the U. S. Geological Survey at about 2,165 net tons of concentrates carrying 60 per cent. of tungsten trioxide and valued at more than $2,000,000. This is a record output, the largest previous one being 1,821 tons in 1910.

While the price of ore late in 1914 was $9 or more per unit of contained tungsten, 60 per cent. ore was sold as low as $5.80 per unit early in 1915. The price has since then steadily advanced until $50, and even as high as $62.50 per unit or more has been paid.

Early in the war England commandeered all the ore that was produced in any of the colonies, fixing a maximum price of 55s. per unit, or about $13.50. American consumers since then have obtained ore from Mexico and South America. Portugal and Spain are also producers, but they are controlled by British capital, says the Engineering and Mining Journal. Only recently have arrangements been made by which tungsten ore, contracted for in Portugal and Spain, may now be shipped, the first cargo of any size leaving for New York in December last. Japan shipped tungsten ore to this country when the price had reached $44 per unit, and large amounts have been booked.

LOW PRESSURE TURBINE USING HAMMER EXHAUST

THE Rockford Drop Forge Co., Rockford, Ill., is installing a 300-k.w. Westinghouse low-pressure turbo-generator set to operate on exhaust steam from the hammers in the forge shop. The hammers number 17, and range in capacity from 800 to 4,000 lb. The exhaust steam is collected in a 10-in. overhead main, and the distance to the turbine station approximates 125 ft. The steam is used at a pressure of 2 lb. at the turbine, and connection is made with the live steam main through a reducing pressure regulator, so that inadequacy of exhaust steam at any time is compensated for automatically.

This turbine unit will supply power for the die-sinking department, and it will also provide for the requirements of the adjacent Mechanics Machine Co., replacing electric power previously purchased. Heretofore the exhaust has only been utilized for shop heating and feed-water heaters, the greater portion having been wasted. With the new turbo-generator unit, a saving of $1,000 per month is figured.

Table I.

GOODS NOW IN DEMAND IN RUSSIA. THESE HAVE BEEN LARGELY SUPPLIED FROM GERMANY, AND ARE SUITED FOR PRODUCTION BY CANADIAN FIRMS.

Abrasives.
Agricultural machinery and implements.
Aluminum cooking utensils.
Ball bearings.
Blowers—Sandblast apparatus.
Boat motors.
Boats, motor.
Boiler fittings—Valves and cocks, indicator, etc.
Combustion engines, internal.
Crude oil engines.
Cutters, milling.
Drills and drilling tools.
Electrical machinery and apparatus of all descriptions.
Enamelled ware.
Extinguishers, fire.
Files.
Friction couplings.
Furnaces—Heating, hardening, tempering.
Gas producers and similar plant.
Governors for shafts, temperatures, revolutions, etc.
Guns, rifles, revolvers.
Hammers, pneumatic.
Hardware and tools.
Hoists.
Laundry machinery.
Machine tools.
Mining machinery.
Motors, gasoline.
Narrow-gauge railways.
Oil cooking stoves.
Optical instruments.
Packing, engine.
Pumps of all kinds.
Pyrometers.
Reamers, etc.
Saw mill machinery.
Scientific instruments.
Separators, cream.
Sewing machines.
Sheet metal working machines.
Sporting requisites.
Steam traps.
Street and road rollers.
Toys—
Turbines—Steam and water.
Typewriters.
Valves of all descriptions.

The following items (table 2) are abstracted from the statement of Russian imports for 1913 furnished by British officials in Petrograd. The proportion of these goods formerly obtained from Germany will indicate the possibilities of future trade when the Allies are in a position to express national sentiment through the medium of tariff regulation.

Table II.

ABSTRACT OF PRINCIPAL ARTICLES IMPORTED INTO RUSSIA DURING THE YEAR 1913.

(Note: One rouble = 52 cents.)

Articles.	From all Countries.	From United Kingdom.	From Germany.
Bricks, fire-bricks, tiles, etc.	3,115,000	428,000	3,275,000
Cast Iron—			
Raw	3,069,000	278,000	1,795,000
Worked	4,042,000	479,000	3,012,000
Iron, assorted	3,782,000	828,000	2,270,000
Iron and steel, articles of	19,461,000	2,338,000	15,329,000
Steel—			
Raw and assorted	1,542,000	398,000	1,032,000
Rails	48,000		
Plates	519,000		
Hardware, cutlery, hand tools, etc.	13,153,000	1,123,000	8,443,000
Copper, aluminum, nickel, bars and rods	12,058,000	1,652,000	5,976,000
Machinery (except agricultural) and parts of	120,705,000	15,060,000	86,890,000
Wire—			
Worked	4,177,000	508,000	1,345,000
Iron, copper, etc.	1,951,000	508,000	3,432,000
Agricultural machinery	36,657,000	6,008,000	12,652,000
Cement, clays and other building materials	5,601,000	812,000	3,026,000
Carriages, motor cars, bicycles, and other vehicles	22,507,000	2,038,000	17,201,000

Big Demand for Coke.—Activity in the metalliferous mines of West Kootenay and the Boundary districts has so increased the demand for coke that every oven in Fernie, B.C., is running, and 200 ovens at Michel, which have been idle for three years, also have been lighted up.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

MOLDING A PULP DRIER RING

By J. H. Eastham

THE angle ring casting shown in plan and section by Fig. 1, forming part of a pulp drier contract, measured at working size, 8 feet 3 inches extreme diameter, 7 feet, 3 inches, inside

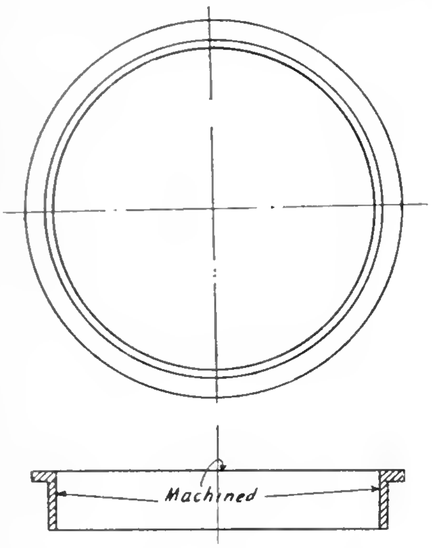


FIG. 1.

diameter, 12 inches deep, and in the rough weighed approximately 3,400 pounds. As the chances of a repeat order were very remote, coupled with the fact that low competitive prices necessitated economical production in every de-

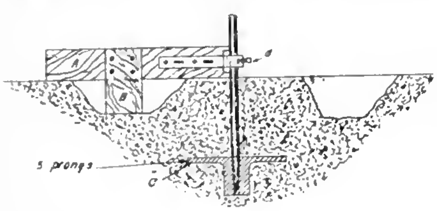


FIG. 2.

partment, a complete pattern was considered out of the question. The method of moulding determined upon was as follows:—

The spindle socket indicated at C, Fig. 2, of type used in loose and swept-up work, was bedded in the foundry floor with its upper face about 12 inches below the mean working level A 2-inch spindle was inserted, and after ramming-

FIG. 3.

up the hole tightly to prevent tilting or subsidence the sweep board A, with bed strickle B attached, was bolted to the spindle arm, and a circular hole 14 inches deep opened up a sufficient area to allow free working space, as shown at Fig. 2.

A bed was next swept up 12 inches below the extreme lower edge of the horizontal board A, the bed board B being then removed, and replaced by the one-sixth pattern section illustrated in

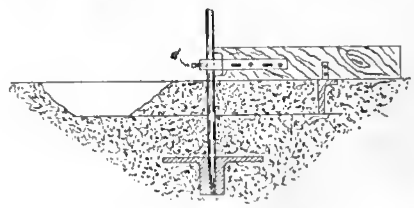


FIG. 4.

plan at Fig. 3, due allowance being made for contraction and machining. Extreme care was necessary at this point; correct dimensions being imperative with a view to keeping machining costs at the lowest figure compatible with a number one finish.

The pattern was now rammed up as shown to the right of sketch, Fig. 4, the set screw (a) slackened to permit of pattern and board being drawn up together,

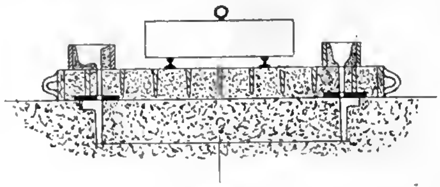


FIG. 5.

moved round and lowered again. About 8 inches of the pattern was left in the first mould impression to prevent "ramming in." This operation was repeated several times until the circle was completed. The board, pattern and spindle were next removed, and the open mould

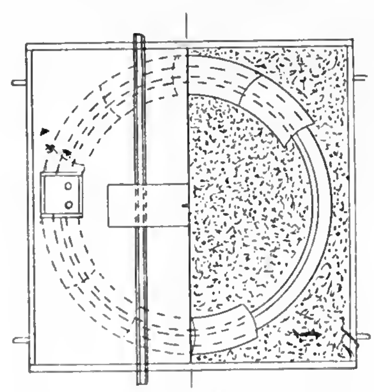


FIG. 6.

covered with interlocking sections of slab cores pierced at various points with 1 in. holes to serve as runners and risers. These cores are shown heavily outlined in black at Fig. 5, and in plan in the composite view of the assembled mould, Fig. 6.

After all the core joints were waste padded to avoid entry of loose sand into the mould, a ten-feet square cope plate was lowered to place, gate pins inserted, and the wedges lightly driven between the lower edges of the cope bars and the upper faces of the cover cores, this being done to prevent strain when pouring. The cope was next rammed full, the runner boxes lined, and cope weighted previous to pouring.

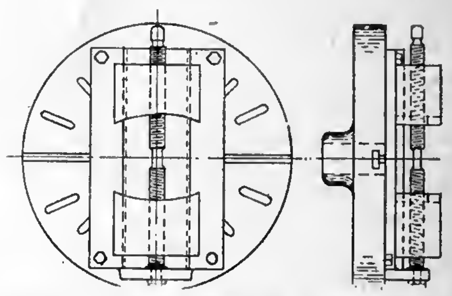
Aside from the very considerable saving in lumber and in patternmaker's time, a careful checking of the foundry costs, including labor, material, and all overhead charges, showed the productive cost of this casting to be 1.75 cents per pound.

SHARPENING LAWN MOWERS

By G. M.

THE method of sharpening and adjusting lawn mowers as described by J. R. Tate in the February 10th issue of Canadian Machinery, has been read with considerable interest, since the writer has also had experience of this particular class of work in a small repair shop.

Although the use of oil and emery in combination is being rapidly superseded by grinding machines, specially adapted



SPECIAL CHUCK USED WHEN SHARPENING LAWN MOWERS.

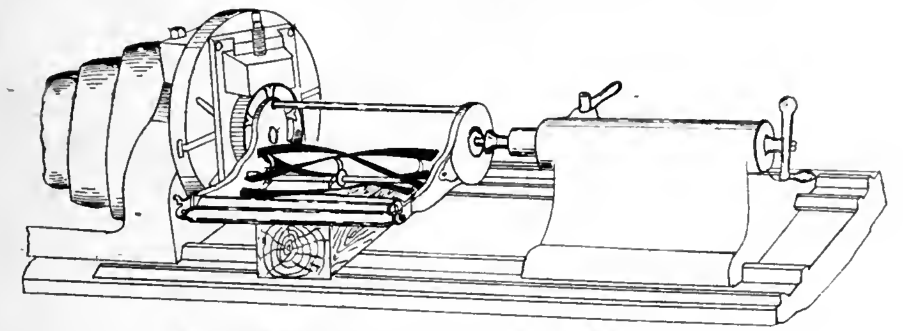
for lawn mower grinder, still the former method is one in which the results obtained will in every case give absolutely satisfaction, owing to the fact that both the knives and the cutter bar are ground down or lapped as one. This then insures a perfect evenness of cut when the mower is in actual operation.

Referring to Mr. Tate's method of grinding, it seems to indicate, that, after the pinions are reversed, and the knife bar set, the mower is turned upside down and "run" for about 300 feet. The manner in which the mower is "run" is not explained, but I understand it to mean that the mower is "pushed" across the floor.

If this be the method adopted by Mr. Tate, I am sure, that he, with a little study could surely devise an even more tradesman-like means of securing results. In a shop, where I was formerly employed, we made profitable use of an old lathe for grinding mowers. A simple two-jawed chuck was made in the manner shown in the sketch. A rectangular base plate, with suitable vees planed thereon was bolted to the face plate. The chuck jaws were made of two solid blocks of cast iron bored and threaded respectively with a right and left-handed square thread. The operating screw was threaded in manner as shown; one end being supported in a lug cast solid with the end of the base casting.

In using this device the mower is driven directly from one wheel; the pinion being previously reversed in order that the knives revolve in the opposite direction to the regular cutting motion. The pinion and wheel on the opposite end are removed and the mower is supported by the wheel axle held in a cup centre. A block of wood of sufficient height is also used to support the centre of the mower and to raise it to a suitable angle in order to allow the mixture of emery and oil, when applied, to gradually run down to the edge of the bar. When the lathe is speeded up, the mower can be quickly as well as satisfactorily ground in four or five minutes.

Another important feature about this method is the fact that the machine when set in motion requires practically no attention apart from an occasional application of the grinding compound; thus, while the machine is in operation, the operator can give his attention during the completion of the grinding, to the preparation of another mower for treatment.



EQUIPMENT FOR SHARPENING LAWN MOWERS.

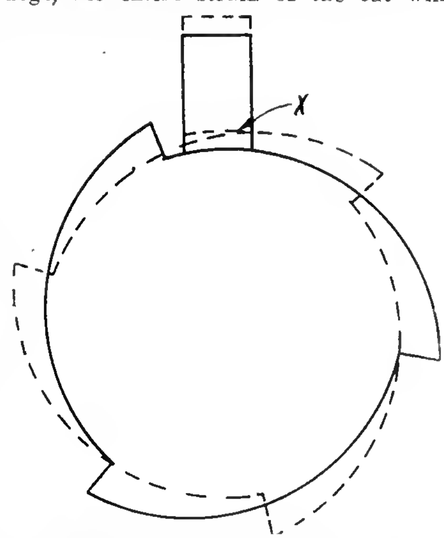
EXPANDING MANDREL CRITICISM

By Chas. F. White

THE expanding mandrel designed by G. Barrett, which was described in the February 3 issue of Canadian Machinery, calls for a certain amount of criticism. This type of mandrel looks quite acceptable on paper, but under actual working conditions, I am sure it would be found lacking in many respects.

In the first place, if this mandrel were intended for use on finished shells, the hardened serrated steel dogs, would have to enter the surface of the shell in order to secure a grip. This then would condemn the shell since the finished bore would be marred to a certain extent. Again, if the mandrel were used on rough shells it would also be impracticable. The size, straightness and taper vary considerably in the forgings, and since each dog would be expanded to the same diameter, the chances are that only one or two of the dogs would grip the forging and thus take the whole strain of the roughing cut.

The body of this arbor, according to Mr. Barrett is milled with a concave cutter, thus forming three arcs. These arcs cannot be struck from the centre of the mandrel, therefore, as the latter rotates and forces out or expands the dogs, the entire strain of the cut will



EXPLANATORY DIAGRAM COVERING EXPANDING MANDREL CRITICISM.

be taken by one sharp edge of the dogs. This can be readily seen by referring to the sketch, in which the dotted lines show the arbor rotated to force out the dog, also the dog in the outer position, the strain being taken on the point X This would naturally cause the edge of the dog—being hard, to cut into and form a shoulder, which would then prevent further rotation of the mandrel.

This mandrel is similar in many respects to the famous McGregor chuck (patented) but it lacks many of the saving perhaps which the McGregor embodies. A few of these features are, the rolling seat behind the jaw, the extreme shortness which gives a minimum amount of trouble with the tailstock, the fact of it being screwed on to the lathe spindle and also its tiger-like grip.

SMALL ARMS AMMUNITION OUTPUT

WE understand that the Dominion Government has made arrangements to increase enormously the output of small arms ammunition in Canada. Some months ago orders were placed for a large quantity of new equipment. The machines will be delivered within the next six or eight weeks, and will make it possible for the Government to provide additional facilities in some central point in Canada for the manufacture of this ammunition. The manufacture of small arms ammunition is now done at the Quebec arsenal, and the new machinery may be placed there. The production capacity will be increased four to five-fold.

SEMI-STEEL

IN a recent paper by J. E. Hurst, read before the Manchester branch of the British Foundrymen's Association, it was pointed out that the steel should be added in the cupola, and that, since the melting point of steel scrap was rarely reached in the ordinary cupola, it was evident that the steel absorbed carbon which lowered the melting point. The necessity of melting hot was, therefore, evident.

The author had met with a good deal of trouble in the matter of pin-holes when adding the steel in large pieces, but the trouble was less when the steel was added in the form of borings; it might be added, however, that this trouble can be overcome by watching the melting heat. An ingenious method of adding steel to cast iron in the ladle was referred to, steel in the form of punchings or turnings being placed in the bottom of the ladle together with some thermit, and as a molten cast was poured upon it, the action of the thermit gave sufficient heat to melt the steel. In the course of the discussion several interesting points were brought out. It was stated that the proportion between the sizes of the pieces of cast iron and of steel was of importance, and should be at least 3 to 1. With respect to obtaining strength in the bar, 35 per cent. of steel was given as the most suitable proportion. The occurrence of hard spots is, of course, a general trouble, and is more frequent when low silicon mixtures are used.

Series of Practical Questions and Answers for Mechanics

Every care is being taken to include only pertinent practical questions, and give same direct, reliable answers. Catch questions will be avoided. Arithmetic, consisting of simple addition, subtraction, multiplication and division will be found a useful companion study.

Question.—A 2-inch drill running 50 revolutions per minute, goes through a 3-inch cast iron web in $4\frac{1}{2}$ minutes. What is the maximum cutting speed in feet per minute, and the feed per revolution?

Answer.—The maximum cutting speed will be that of the outer edge of the drill, or $2 \times 3.1416 \times 50 \div 12 = 26.18$ ft. per minute. The feed per revolution will be the time divided by the thickness, divided by the number of revolutions per minute, or

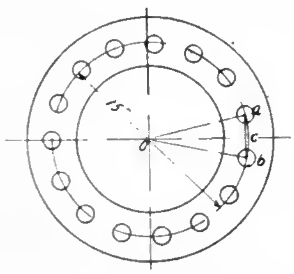
$$\frac{4.5}{3} \qquad \frac{3}{50} = \frac{4.5}{3} \times \frac{1}{50} = \frac{4.5}{150}$$

$= .03$ inch per revolution.

* * *

Question.—On a pipe flange it is required to drill 15 equidistant holes on a 15-inch circle: what would be the step of the trammel or dividers in laying off the centres of the holes.

Answer.—The step or trammel would equal the base of the triangle a. o. b. The angle a.o.c. will be $360 \div 30 = 12$



degrees. To find the length a.c. we proceed as per formula: Side opposite = hypotenuse $\times$ sine $= 7.5 \times .20791 = 1.559$ inches. Therefore step or trammel will equal $1.559 \times 2 = 3.118$ inches.

* * *

Question.—What must be the diameter of a cast iron ball to weigh 15 lbs?

Answer.—A cubic inch of cast iron weighs approximately .26 lbs., therefore, the volume of the ball will be the total weight divided by the weight of a cubic inch, or $15 \div .26 = 57.69$ cubic inch.

The volume of a sphere is equal to .5236 times the cube of the diameter, or $.5236\ d^3$. Diameter would then be the cube root of the volume divided by .5236, or

$$\sqrt[3]{\frac{V}{.5236}} = \sqrt[3]{110.18} = 4.8 \text{ inches}$$

* * *

Question.—Would two poles placed a certain distance apart and in a vertical position be parallel with each other?

Answer.—Theoretically no, practically yes. A vertical line, if extended would pass through the centre of the earth and would therefore form a portion of a radial line, and as two radial lines cannot be parallel, the two poles would be inclined from each other. However, the poles would be considered as parallel for all practical purposes.

* * *

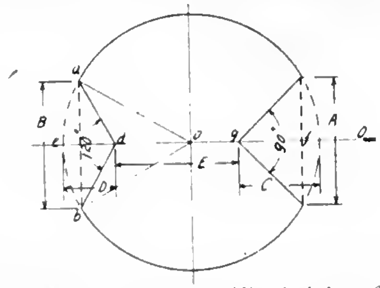
Question. — When turning castings, etc., where the cutting is intermittent, as facing flanges with cored holes, cast gears or pieces with notches, what can be done to avoid the jerking action, which often results in breaking the cutting tool.

Answer.—This can generally be remedied by preventing the work "jumping" ahead as it enters the space. The trouble is greater in an old lathe where bearings and gears are badly worn. By preventing the back lash of the gears and creating a constant pull, much of this annoyance may be removed. A convenient method is to apply sufficient friction to overcome the jerk caused by the tool leaving the cut and entering the space. A narrow board placed below the face plate or chuck circumference and wedged to the desired pressure will give good results.

* * *

Question.—A shaft three inches in diameter requires to have two grooves milled diametrically opposite, as shown in cut, one forming an angle of 90 degrees, and the other an angle of 120 degrees. The length of the arc removed in each case is one-sixth of the circumference. What will be the distance of A and B, depth of cuts C and D, and the distance E?

Answer.—The length A or B would equal the side of a hexagon whose diagonal is three inches but, as the triangle a o b is an equilateral triangle, the length A or B will equal the radius of



the shaft, $1\frac{1}{2}$ inches. The height of the segment will equal the radius minus the length o—e. By formula:—side adjacent = hypotenuse $\times$ cosine $= 1.5 \times 86603 = 1.299$ inches, $e—e = 1.5 - 1.299 = .201$ inches. To find c—d, use formula, side opposite = side adjacent $\times$ tangent, or $c—d = a—c \times .57735 = .75 \times .57735 = .433$ inches. Depth of cut D $= .433 + .201 = .634$ inch.

As f—g equals one half of the diagonal A, the depth of cut C will be $.75 + .201 = .951$ inch. The distance E $= 3 - (.634 + .951) = 1.415$ inches.

* * *

Question.—In the hydraulic press used for the pressing on of the copper bands on shells, what pressure is exerted on the shell?

Answer.—With a gauge pressure of 1,500 lbs. per sq. in. and a cylinder of 6.5 inches diameter, the pressure of each piston will be $1{,}500 \times 6.5^2 \times .7854 = 49{,}770$ lbs., or about 25 tons. With the six cylinders the pressure might be considered as $25 \times 6 = 150$ tons.

NOTES ON PATTERN-MAKING

By J. N. Hill

NO proof is needed of the fact that pattern-making, being the first step in practical engineering work, is of such importance that if faulty castings are obtained it can most probably be traced to the patterns. To ensure sound castings several points must be borne in mind, and some of these should be the care of the designers. In the writer's experience many vital principles are often overlooked, perhaps owing to many designers being trained machinists and fitters but untrained in the production of castings, as is sometimes the case in small shops.

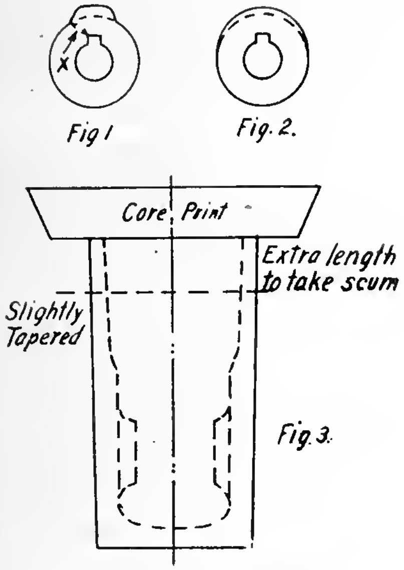
To take just one instance, the bosses of pulley patterns, which require strengthening pieces round the keyway, seldom have the metal properly proportioned. The usual way is to provide a swelling like Fig. 1, which really defeats its purpose as it introduces weakness at X, across which a fracture will occur, if at all, as broken pulleys often prove. If the strengthening piece is made as Fig. 2, then the weak place is avoided, as the metal crystals are more evenly distributed.

Defects such as these can be readily seen by a patternmaker, and are quickly rectified, whereas afterwards it would be difficult. It is essential, therefore, that such matters be looked into, and what follows will deal with some such phases of patternshop practice.

Of course, all drawings or blue prints provided have to be worked to, especially in a shop where direct communication with the designer is impossible, but de-

signers should always remember that the foundryman abominates a pattern that provides for metal of great variation in thickness. Patterns of this sort give a lot of trouble when casting, owing to the metal always flowing towards the heavier parts, leaving blow holes in the lighter parts. Even when good castings are obtainable, and this by running in several places, they are much weaker than castings of a more uniform thickness.

Another point to ensure strength is to provide where possible for the rounding, however small, of all sharp corners, and likewise filleting of sharp angles, for although this adds to the cost of the pat-



NOTES ON PATTERNMAKING.

terns, it lessens the risk of breakdowns and future expense, besides adding to the general appearance of the castings. The above rules are of use to, and are sure to be employed by, a thoroughly trained engineer, as well as helping the patternmaker to guarantee sound castings.

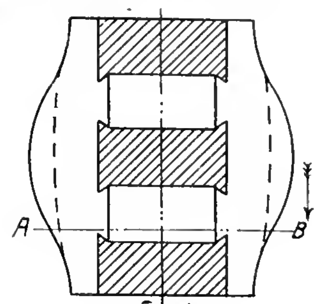
The moulding of patterns, which directly concerns the patternmaker, is of importance. Tapers should be provided where necessary and as much as convenient, sufficiently large bottom box prints to support cores, and well tapered steadying or top box prints. Always make patterns to mould as far as possible in the bottom box or, in other words, taper the patterns and prints up, so that the joint line shall be along the top edge wherever it can be arranged. This will avoid a big lift of top box and also bad joint marks, consequently less cleaning up is necessary.

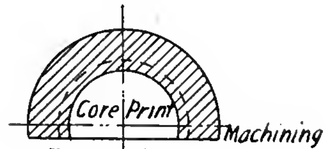
To illustrate an excellent method of moulding, a sketch (Fig. 3) is given of a piston pattern which is made to mould "end down," preventing scum in the head of pistons, thus giving strength and soundness where most needed. In Figs. 4 and 7, a dove-tailed bearing cap for white-metal liner and core box are shown. The dovetails are cored out in the very simple manner shown to give the moulder less work, as moulders hate a lot of fragile loose pieces which soon get broken or lost, resulting in scrappy castings.—Foundry Trade Journal.

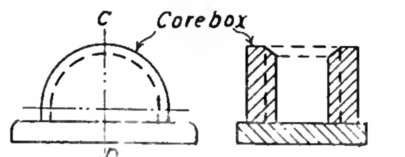
GRINDING HELICAL GEARS

By L. E. Gehman.

THE use of helical gears for speed reduction extends over a great number of years. The cast gear was first used, but







later came the demand for steel cut gears of greater accuracy, especially since the advent of the high-speed turbine. On account of the high speed at which these turbines are driven, the high spots and tool marks soon wear off, leaving the gears loose and very noisy. To overcome this, it is necessary to grind the gears, using a combination of emery and oil or ground glass and oil, the latter proving the most suitable.

It is first necessary to make special grinding pinions, this being on account of the gear being much larger than the pinion. For the smaller sizes it is advisable to cast the pinions and shaft in one piece, but for the larger sizes this is found rather expensive, as some of the pinions weigh several hundred pounds. One manufacturer, who makes a specialty of speed reduction gears, made his grinding pinion as follows:—

The shaft A, Fig. 1, is of a suitable size, and is ground for bearings, the end B being turned to fit a special driving fixture. The pinions C are forced on the

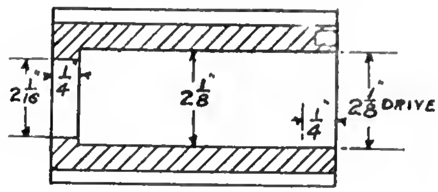


FIG. 2.

shaft near the centre, which is made slightly larger than the bearings. Thus, if the bearings were 2 inches in diameter, the part which holds the pinions would be 2 1-16 in. and 2⅛ in. This may be seen in Fig. 2, which shows a pinion bored to size. Taking for example the shaft 2 inches in diameter at the bearings, the pinions for it would be bored 2⅛ inches to within ¼ in. of the end, and this diameter being made a tight drive fit. The remainder of the pinion is bored 2 1-16 inches. These pinions are held in place by the pin E and clamp F.

The pinion which is held by the pin is driven home, while the one which is held by the clamp is partly forced on by hand. The shaft is then placed in its bearings. The pinion which is only partly on will find its proper position when in mesh with the gear. It is then driven home, following the spiral till it is up against the flange. The clamp F

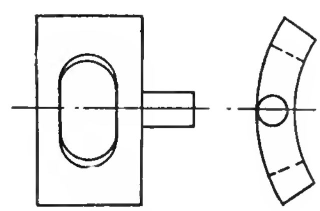


FIG. 3.

is then tightened. This clamp, illustrated in Fig. 3, is made of tool steel and bent to fit a groove in the shaft, and it is tightened by the stud H and the nut K. The hole for the stud is elongated to the length of the circular pitch. The lug L engages with a slot in the pinion and holds it in place.

Several sets of pinions are used in grinding the marks from the gear, and after the gear has been properly ground the pinions which are to be run with the gear are placed in position and ground from the gear.

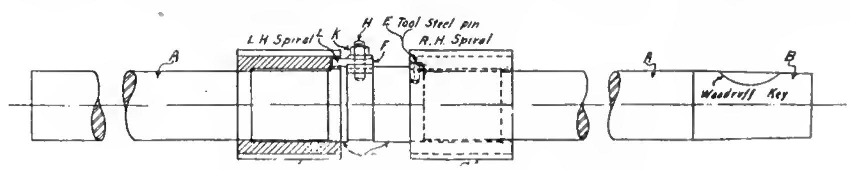


FIG. 1. GRINDING HELICAL GEARS.

NEW PROCESS DEVELOPMENTS

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

METAL CONSTITUENT OF GERMAN SHELLS*

By Dr. J. E. Stead, D.Sc.

As a result of the raid on the North East coast of England on December 16, 1914, by enemy warships, many German shells—whale or in part, became available for analyaical investigation, by British steel interessts.

The pieces analyzed in most cases were small fragments, and it was consequently impossible to determine the dimensions of the shells of which they formed a part. Judging from information received from Hartlepool and other places, it is certain that there were shells of many sizes from 11.2 in. armor-piercing shells down to 4 in. high-explosive shells.

Description of Shells

Many of the larger shells had not burst, and it was possible to measure them. Shrapnel shells do not appear to have been used. The shells used may be divided into two classes, namely: 1—Armour-piercing shells; 2—high-explosive shells. The armour-piercing shell fragments were easily detected by the presence of nickel and chromium—elements universally added to steel employed in that connection. The Germans had affixed to these armour-piercing shells the soft nose pieces which are invariably used with shells of this description. The analyses of fragments of these shells were made by Mr. F. Saniter, of the South Durham Steel Works, and were as follows, namely:—

	Per cent.	Per cent.
Iron (by difference)	91.862	....
Carbon	0.840	0.50
Manganese	0.381	——
Silicon	0.401	0.42
Sulphur	0.033	0.028
Phosphorus	0.032	....
Nickel	3.100	....
Chromium	3.351	....
	100.000	

The several analyses and their sources are given in the following table:

Where found		C %	Mn. %	Si. %	S. %	P. %	Cu. %	N. %	Tenacity	Analysis
West Hartlepool	1	0.60	0.73	—	0.062	0.085	—	—	—	Wilson
" "	2	0.70	0.80	0.35	0.027	0.043	—	—	55	Pattison and Stead
" "	3	0.670	0.515	0.336	0.037	0.048	0.083	—	62	Pattison and Stead
" "	4	0.870	1.094	0.252	0.037	0.028	0.080	—	65	Pattison and Stead
" "	5	0.465	0.794	0.324	0.038	0.028	0.090	—	55	Pattison and Stead
" "	6	0.600	0.655	0.597	0.046	0.051	—	—	—	F Saniter
" "	7	0.820	1.266	0.186	0.048	0.052	—	—	—	F Saniter
" "	8	0.765	0.655	0.364	0.030	0.045	—	—	—	F Saniter
" "	9	0.630	0.550	0.400	0.042	0.077	—	—	—	F Saniter
" " (8 in. sh.)	10	0.86	1.03	0.186	0.053	0.045	—	—	—	F Saniter
" "	11	1.12	1.00	0.23	0.054	0.038	—	—	—	Bainbridge
Whitby and Scarborough	12	0.850	1.330	—	0.080	0.105	—	—	—	Wilson
" " "	13	0.60	1.21	0.334	0.071	0.069	—	0.0112	59	Pattison and Stead
" " "	14	0.74	1.170	0.261	0.044	0.064	—	—	62	Pattison and Stead
Dunkirk	15	0.675	0.380	0.078	0.083	0.043	—	—	—	Bainbridge
Ypres	16	0.700	1.108	0.221	0.041	0.079	—	—	—	Pattison and Stead
Flanders	17	0.98	1.05	—	0.055	0.086	—	—	—	Wilson and Bainbridge
"	18	0.93	0.98	—	0.059	0.065	—	—	—	Wilson and Bainbridge
"	19	0.74	0.98	—	0.054	0.050	—	—	—	Wilson and Bainbridge
German	20	0.393	1.400	0.210	0.035	0.041	—	—	—	Sillars
France	21	0.930	0.970	0.164	0.032	0.048	—	—	—	Sillars

What the Shell Fragments Show

Most of the fragments examined were small, and the fractures generally indicated material of very high tenacity. There were a few large pieces, and these had a much coarser crystalline structure than the smaller ones. It is well known that the appearance of the fractured surfaces of metals broken by sudden shock is a very useful guide in forming a correct judgment of the physical character of the material. If the surfaces are more or less coarsely granular, and the fracture has travelled in straight planes, the material is usually relatively weak. Such fractures somewhat resemble the fractures of lump sugar. If they are more finely granular the surfaces are not usually flat, and frequently have tongues or pointed strips of metal attached to the fracture, suggesting a tearing action and tough material. Some of the inner and outer surfaces of the shell fragments were fissured by a multitude of fine cracks, generally parallel to the vertical axis of the shell. The flat surfaces of one of the base plugs where it came into contact with the explosive charge were similarly broken up into fissures, but these did not extend to the outside of the plug. The force must have been of such violence as to tend to tear the metal to pieces.

One writer in describing the German shell fragments says: "We can have little conception of the terrible nature of these until they are handled. They bristle all over with horrible points and edges—some as keen as a razor." One peculiarity is the manner in which the fragments broke, leaving what may be described as "shear fractured surfaces," with sharp knife-like terminations. The tracks of the fractures were often at angles of 35 deg. to 45 deg. to tangents of the shells, and the broken surfaces of many of them had a somewhat fibrous appearance characteristic of great toughness. Tests made on the fragments of both the coarsely granular and fibrous varieties confirmed the conclusion that the former were brittle and the latter extremely tough.

The fragment corresponding to analysis No. 13 was particularly interesting. It had "shear fractures" on both its sides, was of fine crystalline structure, and evidently ideal in its character, yet this contained about 0.07 per cent. sulphur and the same amount of phosphorus. Moreover, it contained 0.011 per cent. nitrogen; an indication that it was made by the Bessemer process, for no open-hearth steel, so far as is known, contains nearly so much of that element. As acid Bessemer converters are rare, if not non-existent, in Germany, it is justifiable to conclude that the steel is basic Bessemer. This fragment showed a fine micro-structure with practically no free ferrite, due to the exceedingly high proportion of manganese present. In metallographical terms, the steel was sorbitic, consisting of unsegregated pearlite. On reheating to about 800 deg. Cent. and cooling in about half an hour to 400 deg. Cent. and then to 15 deg. Cent., its original structure and hardness were reproduced. The Brinell hardness number was 255 deg., equal to about a tenacity of 56 to 57 tons per square inch. What the elongation was could not be determined, but it certainly would not exceed 12 per cent.

Little comment is necessary on the armour-piercing shells. A broken piece

*From a paper read before the Cleveland, England, Institute of Engineers.

from the point was exceedingly hard, as indicated by the Brinell machine. The shell had evidently exploded on coming into contact with something not hard enough to damage the point itself. The projectile is 3 ft. long, 11.2 in. diameter and weighs 7½ cwt. For obvious reasons one cannot compare the shells produced by the Germans with those produced by the Allies, although, no doubt, the enemy knows all about the latter.

High Explosive Shell Analyses

On examining the analyses of the high explosive shells, one cannot help being struck with the very wide range in the composition. Placing side by side the maximum and minimum amount of each element, we have:—

	Per cent.
Carbon	0.393 to 1.12
Manganese	0.380 to 1.40
Silicon	0.078 to 0.597
Sulphur	0.027 to 0.083
Phosphorus	0.028 to 0.105

Out of the twenty-two analyses, nine show more than 1 per cent. manganese, seven show more than 0.3 per cent. silicon; twelve more than 0.2 per cent. silicon; three show more than 0.07 per cent. sulphur; five more than 0.06 per cent. phosphorus. The average per cent. of carbon is 0.75 per cent. What is the reason for these great variations? One cannot, of course, say with certainty, but there are only two explanations one can offer:

1.—That the German authorities have been careless in their selection of the steel. That the occasional premature bursting of a shell in a gun and the consequent destruction of the gun and gunners did not matter, as they had so many guns and men to spare, a suggestion actually made, but which is obviously absurd.

2.—That the German experts have found that provided the steel is suitable for the purpose required, a great latitude in the composition and physical properties is permissible.

I think the first hypothesis may be dismissed without much consideration, for the very shells sent into our towns, varying greatly in composition, did not burst in the gun, and also because the Germans have devoted more time and money and thought to the preparation for this war than any other people. We must admit they know what they are doing, at least as well as we do.

Shell Deformation In Gun

An examination of the larger fragments of German shells did not lead to the discovery of anything in the nature of rokes or surface flaws, and the very high percentages of silicon and manganese in most of them suggest that soundness was considered as of primary importance. The fact that nitrogen was found in a relatively large quantity in one of the best specimens, leads to the conclusion that nitrogen is not harmful, and that probably basic Bessemer steel has been found quite suitable, provided a sufficient quantity of silicon and manganese is present to ensure soundness. Any intelligent person with no engineering or special knowledge of the subject would tell us at once that the stresses put on a shell in the gun are compressive not tensional. That if the shell were made of lead instead of steel, the sudden compressive force applied to the base would cause the shell walls to bulge outwards, and to become reduced in length, and that very soft steel would probably behave in the same manner. Therefore, the Germans were careful to avoid this, and made steel strong enough to resist deformation by compression in the guns.

We may conclude, therefore, that what was feared was bulging more than breakage by shock. It cannot be denied by anyone who knows that steel containing 0.75 per cent. carbon and above 1.2 per cent. manganese is brittle to shock, and that if such material were made into a rail and were tested in the usual way, it would fly to pieces under falling weight test, yet steel shells of that description did not burst in the German guns, but burst on us. Every rail maker knows that a shell containing 0.10 per cent. sulphur and phosphorus, 0.45 per cent. carbon and 0.8 per cent. manganese would be less liable to break under shock than such steel if sulphur and phosphorus were entirely absent.

Premature Explosion

What must be avoided is anything at all likely to cause explosion of the shell whilst in the gun itself. There are several conditions which might lead to premature explosion.

(1)—Defective fuses.

(2)—The possible formation of sensitive compounds, such as picrate of lead and other metallic picrates, due to the accidental presence of particles of lead, etc., which on being acted on by picric acid might lead to the formation of the sensitive salts referred to.

(3)—Gross porosity of the base of the shell sufficient to admit hot gases from the ignited propellant.

(4)—Allowing the shells to rest for a long period in a very hot gun tube, whereby the detonator explodes and the charge is fired.

(5)—Shells made of steel of too soft a character, causing bulging and excessive friction between the shell walls and the sides of the gun tube, leading to the accentuated pressure of the propellent gases exceeding the bursting pressure.

(6)—Excessive brittleness of the steel.

It is obvious that when a gun has burst it is impossible to say whether the fuses have been defective or whether the cause has been the presence of explosive picrates, or if the steel has been porous. It might be possible to determine whether the shell jammed or the steel was excessively brittle. Those who loaded the shells and fixed the fuses, of course, could not be convicted no matter how badly their work was done. Yet I, myself, have seen a shell burst directly it left the gun tube, a happening which could only be explained on the assumption that something was wrong other than the steel itself. The officer in charge concluded that the fuses were at fault.

Mechanical Test vs. Chemical Analyses of Shell Steel

The analyses of the German shells naturally makes us question our own practice and specifications, which lead to the rejection of material such as would be accepted in Germany. Our authorities may have proofs I do not know of, justifying their specifications, but to say a shell has burst in a gun, therefore the steel is at fault, is not justifiable, neither is it justifiable to form any dogmatic conclusion without ample proof. We have the highest respect for the systematic and most careful methods our authorities use to guard the lives of our gunners and guns, and their conscientious adherence to what they consider to be the right thing. It would be morally criminal if they were to allow unsuitable steel to be made into shells. The only question is, and we are justified in asking it, whether they are certain as to what is suitable and what unsuitable material. It must be obvious that it is only by mechanical testing that one can find out. For reasons I need not mention, the methods or method of testing shells cannot be discussed here. One method gives conclusive proof that steel of a certain origin which is not at present admitted by our authorities, is quite suitable for high-explosive shells. Further trials are in course of execution, which it is proposed to ask some of the gentlemen responsible for our specifications to witness. One thing we must admit, and that is that if a steel is proved by suitable mechanical testing to be satisfactory, on no account should it be rejected on chemical analyses, for one remembers that mechanical testing is the base on which rests all chemical specification. As you know, I am an analytical chemist, and it is not to my interest to make that statement, but long experience, actual knowledge, common sense, and my country's welfare force me to state what I believe to be the truth.

Conclusions Arrived At

In conclusion, judging from the analyses of the German shells, it would appear:

(1)—That our enemies are not par-

ticular in having shell steel of uniform quality.

(2)—That the steel used is generally of relatively high tenacity, and much more liable to break up by shock than what we produce and prescribe.

(3)—That most probably some of the German shells are made by the basic Bessemer progress, judging from the relatively large amount of nitrogen present in one of the toughest and best fragments, which also contained 0.07 per cent. sulphur and phosphorus.

(4)—That the analyses of the armour-piercing shells correspond with analyses of similar material made in other countries.

(5)—That if the high-explosive shells with between 0.07 and 0.1 per cent. phosphorus did not burst in the gun, it seems probable that great freedom from that element has been found to be unnecessary.

In view of these considerations, is there not reason for our authorities to doubt the expert advice given them—on which, of course, they must depend—to restrict so drastically the allowable quantity of both sulphur and phosphorus, and thereby restricting the output of shell steel. As the question can so readily be settled by making suitable mechanical tests on the finished shells, such as I myself have made with convincing result on material at present barred, is it not in the national interest that such tests should be made without the usual delay by the authorities at head quarters? If the results of my mechanical tests are confirmed, then the obvious thing to do is to alter the specifications forthwith. If the mechanical tests are found to be conclusive, then it would be a national crime to reject material on any chemical specification before submitting the steel in question in the form of a finished shell, to the more convincing mechanical test.

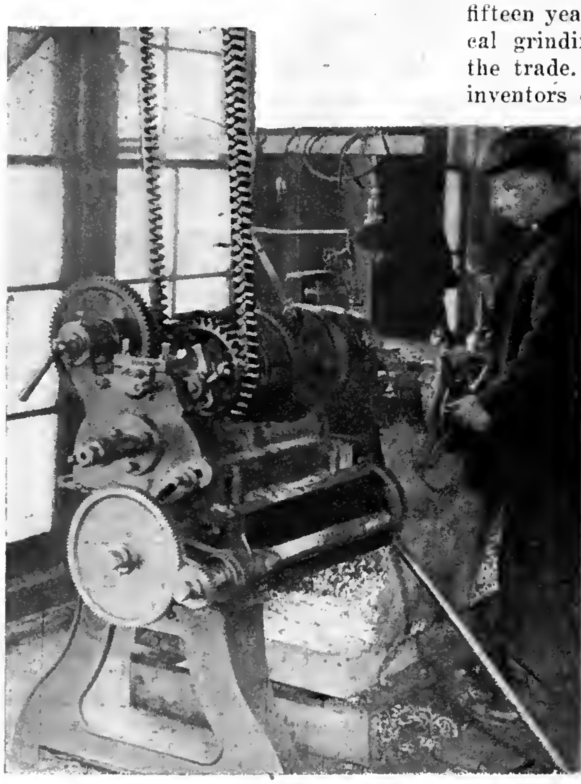
SILENT CHAIN DRIVE INCREASES SHELL PRODUCTION

By J. H. R.

OWING to the difficulty of securing suitable machinery within a specified time, many of the manufacturing plants now making explosive shells, and other munitions, were forced to remodel old machines, or equip them with special attachments before being in a position to complete all the operations. In a large number of cases, machines which were thought to have long passed their span of usefulness, were pressed into service, to take part in the rapid development of the shell making industry.

One of the large engineering firms in Montreal, who were somewhat late in getting started, decided to use their shop equipment, as far as possible, in the production of 4.5 shells. Very little of the machinery was of modern design, but tools were overhauled, and suitable attachments designed and constructed, with the result that a very satisfactory output is now being mantained.

One of the greatest difficulties encountered was on the lathe selected for the turning of the copper bands. To secure increased driving power the cone pulley was removed from the spindle and also the counter shaft, and replaced by two 10-inch diameter, 6-inch face pulleys. A five-inch belt was first tried, but proved unsatisfactory. The use of two belts, one on top of the other failed to give the desired result, as it seemed impossible to overcome the slip of the belt, under load which was considerable when the cutting tools were operating on the copper bands. The drive being almost vertical, the tension on the belt was so great that it was necessary to clamp the lathe to the floor to keep it in position. This also was the cause of overheating of the spindle bearings. However, with this arrangement the best output obtainable was about 80 shells per day of 10 hours.


BAND TURNING LATHE WITH "RENOLD" SILENT CHAIN DRIVE WHICH INCREASED OUTPUT 200 PER CENT.

As this was the only machine available for this particular operation, the production was not sufficient to keep pace with the other machines, and on the advice of a transmission engineer it was decided to equip the lathe with a chain drive.

The cut shows the lathe fitted with a "Renold" 2-inch silent chain running over 10 in. diameter cast iron sprockets; the chain being guided by the centre links extending beyond the normal face of the sprocket and running in a groove. The expectations of the officials were more than realized, as the output rose to 250 shells in ten hours, an increase of over 200 per cent.

The centre distance of the shafts was about 10 feet, requiring about 23 feet of chain, but the advantage of increased output, long life of chain and elimination of belt and bearing trouble, more than repaid the initial cost of installation.

FINISHING BY GRINDING

By C. W. Blakeslee

IN late years what a tremendous advance has been made, especially in precision grinding. I recall about fifteen years ago the first large cylindrical grinding machine being offered to the trade. When one of the principal inventors of the machine called on the big engine builders in the Middle West, well do I remember how little consideration was given the man who was years ahead of the time, as is proved by the fact that thousands of those very machines are used for the purpose of roughing as well as finishing by grinding the world over at the present time.

Three of the most important objections made at that time to the grinding machine were: The belief that the particles of emery would imbed themselves in the work, that the wheel would be reduced anywhere from 1/8 to 1/4 in. in grinding from one end of the work to the other, and, further, that the price was entirely too high for a grinding machine. Argument after argument against installing the machine even on trial was brought forth. "No, sir, there was nothing to it." The method of finishing in the lathe with a water tool, a file, an emery cloth fastened to a "slapstick" and oil could not be beaten, but the inventor knew he was right.

Strange to note, where water some years ago was considered most essential for milling and gear cutters, reamers, slitting saws and such fine edge tools, practically no water is used at the present time on these classes of fine edge tools excepting, of course, the larger class of inserted tooth milling cutters and reamers, thus demonstrating the wonderful advance of the wheel manufacturer to a position to furnish extremely soft, porous and consequently cool cutting wheels.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

PORTABLE COMBINATION WOOD-WORKER

THE advantages to be obtained through the use of what is termed a combination woodworker, are such that without one a modern pattern or carpenter shop may find itself somewhat seriously handicapped. Possibly the chief value of such a tool lies in the fact that its scope of application is wide and diversified.

Machines of this class have been on the market for some time, and each has its own special features which go towards making it a valuable asset to the shop or mill in which it may be operated.

An excellent idea of the portable combination woodworker being manufactured by the Hutchinson Woodworker Co., Sherbourne Street, Toronto, may be obtained by referring to the accompanying cut, Fig. 1. It will be seen that its attractive features lie in compactness and rigid, self-contained construction. The table is of cast iron with a maple top, the whole being securely braced, thus doing away with abnormal vibration.

The main supporting column is made of extra heavy steel tubing, which is supported on a suitable cross piece by means of clamps placed beneath the table as shown. To this column is fitted a heavy cast iron bracket, which supports the two steel rods carrying the motor and the saw mandrel. The motor is secured to a base plate, which in turn is bolted to the back end of the steel rods by means of countersunk head, set screws.

The saw mandrel is supported in a suitable casting, secured to the front end of the steel rods. An idea of the construction of this casting may be readily obtained by referring to Fig. 1. At the top of the casting is a horizontal handle, by means of which the workman is enabled to draw the saw through the work. It may also be stated that the mandrel is fitted with self-oiling boxes which from their design prevent oil from running on to the finished work.

An interesting feature of the machine is the ball-bearing rollers which carry the steel rods, thus insuring an easy horizontal motion. A sketch of the arrangement showing the manner of adjustment is shown in Fig. 2. The roller is counterbored at both ends and the two ball-races are fitted therein. The supporting spindle is turned eccentrically as shown, permitting any adjustment which may be necessary. Thus, if the rods, bear too heavily, or too lightly on the rollers, the set screws which hold spindle in place are loosened, and the spindle is turned in the direction which may be necessary to raise or lower the roller.

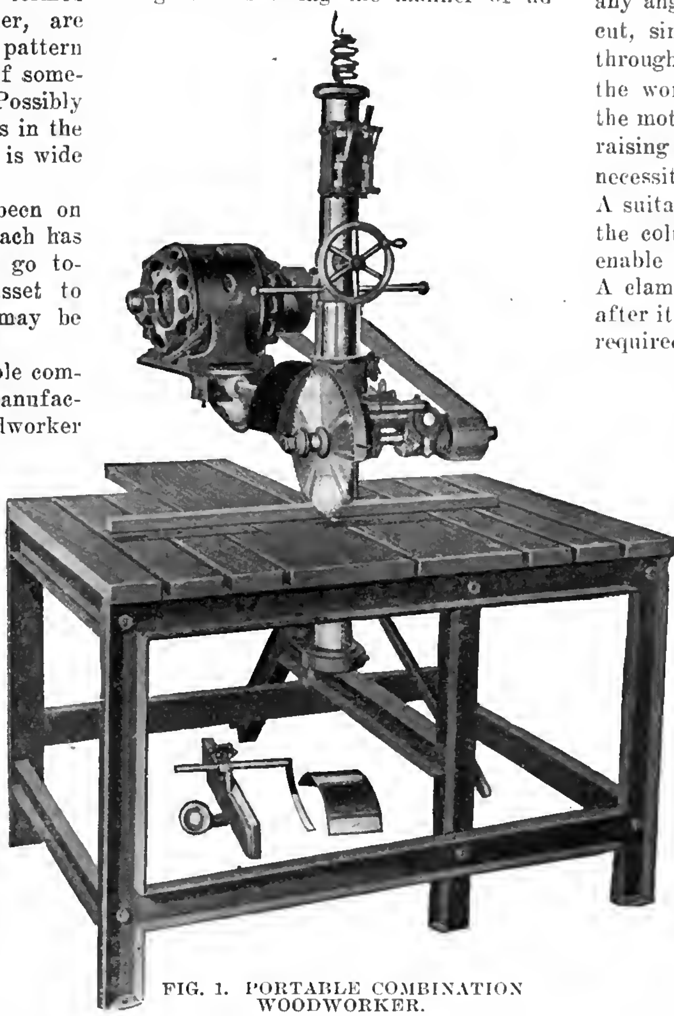
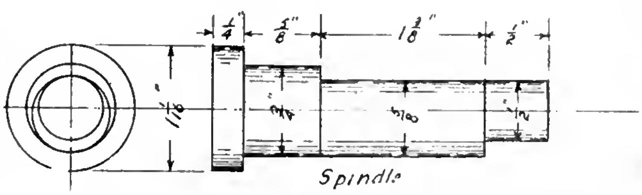


FIG. 1. PORTABLE COMBINATION WOODWORKER.



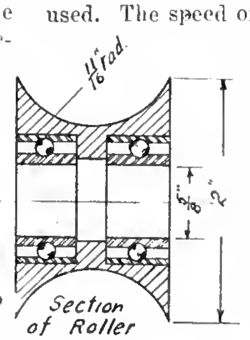


FIG. 2. ADJUSTABLE BALL-BEARING ROLLER AND SPINDLE.

The saw can be made to operate at any angle and also to take any depth of cut, since it can be raised or lowered through a space of eight inches to suit the work. Further, the fact that both the motor and saw move as one piece, the raising or lowering of the saw does not necessitate any adjustment of the belt. A suitable clamp is provided for locking the column after it has been turned to enable the saw to cut the desired angle. A clamp also locks the bracket in place after it has been raised or lowered to the required height. The method of adjusting the depth of the cut is by means of the handwheel shown. This operates a pair of mitre gears and a suitable square threaded spindle; the latter engaging with a bronze nut held in the bracket.

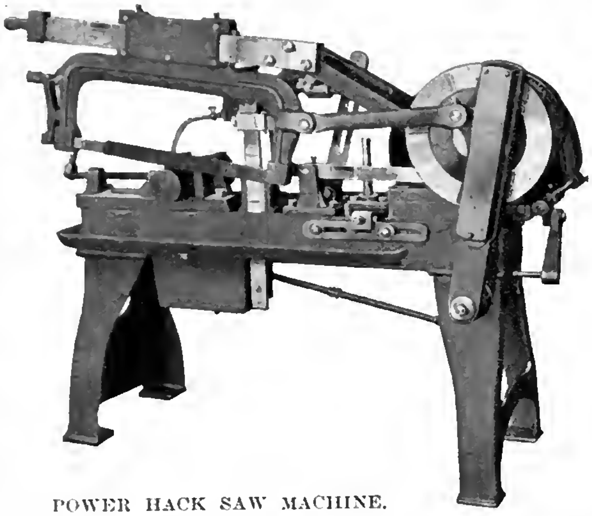
The range of work, as previously mentioned, is practically unlimited; cross-cutting, ripping, dadoeing, sandpapering and boring being accomplished with the least amount of labor. For sandpapering, a special cast iron disc is provided, to the face of which is secured the paper. Boring is accomplished by means of a special chuck secured to the pulley end of the mandrel.

The machine is driven by means of 1½ h.p. single phase, 25-cycle motor, or through a 2½ h.p. single phase, 60-cycle motor, with swivel placed conveniently at top of column. The length of drive is 46 inches, and 3 in. balata belting is used. The speed of the saw is 2,500 r.p.m. Another advantage of this machine is the fact that by means of a cone pulley, the motor can be made to drive both the saw and a pony jointer at the same time. An interesting type of the latter machine is also manufactured by the Hutchinson Woodworking Co.

M. Gorman, proprietor of the Gorman Foundry Petrolia. Ont., died on Feb. 13.

HIGH DUTY POWER HACK SAW MACHINE

THE Diamond Saw & Stamping Works of Buffalo, N.Y., have recently developed a heavy duty power hack saw machine, which they term No. 5 "Sterling," and in which are embodied a number of interesting features. Its construction and design enable it to give a maximum cut when running at from 50 to 55 strokes per minute. The fact of running at this slow speed naturally adds very materially to the life of blade, and this is particularly important at the present time on account of the great amount of round steel, high in carbon and manganese being cut.


POWER HACK SAW MACHINE.

Normally weighted, we understand, this machine with a new and sharp blade separates 3½ in. round material, in from three to four minutes and has a record of thirty-two cuts being made with one blade on 3½ in. round material high in carbon and manganese at an average of 5½ minutes per cut. The machine is designed particularly to cut material in diameter from 6 in. round and under.

Besides its other special features it has an automatic lift which is positive and raises the blade on return stroke. It works all the time and is one of the particularly effective features of the unit. Tight and loose pulleys are used for driving.

RUSSIAN SHELL PRODUCTION CONTROVERSY

STATEMENTS to the effect that the high explosive shells being manufactured on the Canadian Car & Foundry Co.'s Russian contract were technical "freaks" and had caused difficulty—in some instances almost bankruptcy — to firms making them, and that the Car Company, through the Imperial Munitions Board at Ottawa, had endeavored to foist unprofitable business on Canadian firms, have been denied by W. W. Butler, senior vice-president, and F. A. Skelton, secretary-treasurer and a director of the Canadian Car & Foundry Co. The charges that the company had been "let in" by accepting the business, and that the Munitions Board had come to the rescue by trying to distribute the work among firms in this country, were contained in a bitter attack on the Ottawa officals by a Toronto paper.

The Tapored Bore Feature

The main point brought out in the article was that the high explosive shells, called for a tapered bore, and not a straight bore, like British shells. Some American firms who accepted the business were said to have lost money, while others were said to have refused contracts after examination of the blue prints. The article alleges that the Munitions Board and the Car Co. tried to arrange with Canadian firms to turn out five million of the "trick" shells.

Mr. Butler states that from the acceptance of the contract until the present time no participants had actually encountered any technical difficulty; that 125 firms, and not 256, as alleged, were sharing in the business; that the best proof that the company had not been "let in" lay in the fact that one of the firms specifically mentioned as having refused a portion of the contract on account of the tapered bore, had been actively engaged for months in producing, and was now shipping large quantities of the "trick" shells. Further, the Car Company did not have a contract for five million high explosive shells to begin with. The original order of $83,000,000 was divided into 2,500,000 shrapnel and 2,500,000 high explosive missiles.

Mr. Butler says that the attack on the Munitions Board is unwarranted. A number of Canadian munition firms applied to Ottawa for additional shell contracts and as at the time there were no Imperial Government orders to be placed, it was suggested that they might accept portions of the Canadian Car Co. Russian order. They were offered sub-contracts at a slightly higher figure than that at which the same class of work had been distributed among American manufacturers. Most of them could not promise the delivery necessary and, as a result, most of the business had since been placed in the United States.

Mr. Butler names two firms in Montreal who have accepted orders for Russian high explosive shells. One of them had been working on the business for some weeks and was turning out the so-called "trick" shells without difficulty.

About two weeks ago the Car Company received a concession from the Russian Government, allowing the substitution of the straight for the tapered bore, and it is expected that hereafter most of the firms participating in the business will adopt the British rather than the Russian standard.

The delays experienced had not been due to technical trouble arising from manufacturing operations, but to financial difficulties. These had been satisfactorily arranged and it would now be possible for officials of the company to devote their energies to speeding up production, a thing impossible while the financial outlook was uncertain.

Both Mr. Butler and Mr. Skelton say that the Car Company's affairs are in a healthy condition. They resent keenly an insinuation that either the Car company or the Munitions Board had tried to load up Canadian concerns with unprofitable business and believe that the next few months will prove that the so-called "trick" shells have been manufactured at a comfortable profit for both the sub-contractors and the Canadian Car & Foundry Company.

DOMINION REVENUE AND WAR EXPENSE

The net debt of Canada at the end of January totalled $527,488,999, says an Ottawa despatch, an increase of $12,344,980 during the month of January and of $132,110,983 during the twelve months. War expenditure for the month of January is given in the monthly financial statement as $12,237,788 and for the ten months of the current fiscal year $97,986,686.

Revenue for January totalled $17,522,000, an increase of nearly eight millions as compared with January of last year. Of this increase, a little over five millions comes from Customs receipts. For the ten months of the current fiscal year the total revenue has amounted to $139,550,000, an increase of a little over thirty millions as compared with the corresponding ten months of 1914-15.

According to present indications, the total revenue for the fiscal year should run between 165 and 170 million dollars, or about 40 million dollars more than last year. Total expenditure on revenue account for the ordinary expenses of administration will probably run up to about 145 or 150 millions, or a little over ten millions less than last year. Capital expenditure apart from the war will probably reach in the neighborhood of 40 million dollars.

The MacLean Publishing Company
LIMITED

(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor.

Associate Editors,
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

B. G. NEWTON - - - - - Advertising Manager
Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. FEBRUARY 17, 1916 No. 7

CURT AND TO THE POINT

IN reply to a member's question a few days ago in the House of Commons, Ottawa, as to the Government's intentions regarding the appointment of a Canadian Minister of Munitions, Sir Robert Borden submitted a written answer embracing one word. It was "no."

Curt and to the point, and sufficiently emphatic to reassure and restore confidence even among those to whom the depth of imaginings had given place to a real belief that the management of munitions contracts and their subsequent fulfilment were in a state of chaos and oppressed incompetence, it would seem nothing short of fanaticism then to push further, as is being done in some quarters, the demand for a Canadian Ministry of Munitions. There is nothing modest in the insistent attitude being adopted towards the establishment of such an office; even although the lack of modesty may constitute a virtue betimes. The cause in such circumstances must needs be a just one, however.

OPPORTUNITY AND PRIVILEGE

A PLEASING feature in connection with the recent Canadian Patriotic Fund Campaign is that of the appearance of so many United States manufacturing and financial concerns among the lists of contributors. The war has had a beneficial influence on American industries, both as regards their activities and their profit-earning, due of course in great measure to the large-in-quantity and varied-in-kind orders for machine tools, raw and semi-finished materials, munitions and general supplies, placed direct by Great Britain and her Allies.

Of necessity, Canada, although also a direct recipient of the Entente Powers' favor in the matter of war contracts for the above-mentioned commodities, had to have recourse to a considerable extent, to American manufacturers for equipment to enable her metal-working and other plants to meet promptly the unique situation thrust upon her. The opportunity to serve us by the United States interests concerned, has been fully taken advantage of, and our immediate needs have met with a ready response. Is it not then a matter of more than ordinary satisfaction that the co-operation displayed in catering to our plant equipment requirements should find still further exemplification, and that as a privilege, when war-created tasks peculiarly our own have to be undertaken and their accomplishment success-crowned?

THOSE RUSSIAN SHELL ORDERS

SHELLS contracted for by the Russian Government, and more particularly the big order secured by the Canadian Car & Foundry Co., Montreal, have been much in the limelight during recent weeks. The hugeness of component quantity of shells and financing involved naturally called for administrative skill of the highest order, both in distributing the work and providing the capital necessary to secure prompt and satisfactory accomplishment. From a report on the opposite page it will be noted that a successful outcome in both directions is now assured.

Our Imperial Munitions Board in the sincerity of their activities to maintain to the fullest extent possible the productive capacity of those of our metal-working plants whose British shell contracts were on the eve of completion, acquired a large block of Russian 2.96 in. H.E. shells from the Canadian Car & Foundry Co. Immediately, however, it was noted that the design and finish features differed in some respects—materially, so far as productive cost was concerned, we might say, from the corresponding British shell of our manufacture.

Dame rumor gets busy, and sinister motives have been imputed to both the Imperial Munitions Board and the Canadian Car & Foundry Co. Is our patriotism so bubbling-over-British that we have no place in our make-up for Britain's Allies, or are we unwilling to meet a more exacting test of our mechanical engineering skill in tackling the new proposition offered? The latter would seem so if the report of refusals of Russian shell orders is any criterion. The views of the Chairman of the Imperial Munitions Board on the foregoing and with reference to the shell situation generally in Canada which we quote below are worthy of close scrutiny and serious consideration by those of our manufacturers approaching completion of or who have already completed all contracts on hand for British type shells:

"No manufacturer," says Mr. Flavelle, "has refused a contract because of the price named for machining and assembling shells or for supplying any other product required by the Imperial Munitions Board. We have had a great number of contractors who have been disappointed because they did not secure a contract at the prices now current. The report in question may have arisen out of the disinclination of some of the contractors to accept some Russian business which we secured but which they refused, fearing Russian inspection.

"At the moment, manufacturers who have had contracts for 18-pounder high explosives are concerned as to renewal orders or as to what shell they can secure in place of these 18-pounders, as the Imperial authorities have indicated they do not desire to continue the manufacture of this size. On all other sizes, manufacturers have a sufficient supply to keep them occupied for periods of from a very few months to the next twelve months.

"Broadly speaking, manufacturers are eager to quote even lower prices than those at which recent contracts have been let, if they could feel assured of continuous operation during 1916. The development of capacity to do this work in England, however, has increased so largely that they are unwilling at the moment to extend orders to Canada for a sufficient number of shells to satisfy the capacity of all manufacturers who desire to do this work.

"We hope the British authorities may see their way clear at the termination of the present contracts in England, to divert some of their factories machining and assembling shells to other work which we could not so easily do for them in Canada, and thus place an added number of shells at the disposal of Canadian manufacturers. Naturally this is a consideration which could not be settled without the whole question being looked into."

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	
	Montreal.	**Toronto.**
Middlesboro, No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	.....
Victoria, No. 2X	26 00	.....
Victoria, No. 2 plain	26 00	.....
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	2.75
Steel bars, 2 in. and larger, base	4.00
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	3.00
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	2.50
Structural shapes	2.50
Plates	2.70

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

Freight, Pittsburgh to Winnipeg

64.9 cents carload; 85.1 cents less carload.

BOILER PLATES.

	Montreal	Toronto
Plates, $\frac{1}{4}$ to $\frac{1}{2}$ in., 100 lb.	$3 00	$3 25
Heads, per 100 lb.	3 20	3 45
Tank plates, 3-16 in.	3 25	3 55

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto.
Lake copper, carload	$30 00	$30 00
Electrolytic copper	30 00	30 00
Castings, copper	29 00	29 50
Tin	46 00	46 00
Spelter	22 00	22 00
Lead	8 00	8 00
Antimony	50 00	47 00
Aluminum	68 00	68 00

Prices per 100 lbs.

WROUGHT IRON PIPE

Prices in effect Jan. 24, 1916

Buttweld

Per 100 feet	Black	Galv.
$\frac{1}{4}$ and $\frac{3}{8}$ in.	$ 2 52	$ 4 23
$\frac{1}{2}$ in.	3 15	4 89
$\frac{3}{4}$ in.	3 68	6 04
1 in.	5 44	8 93
$1\frac{1}{4}$ in.	7 36	12 08
$1\frac{1}{2}$ in.	8 80	14 44
2 in.	11 84	19 43
$2\frac{1}{2}$ in.	18 72	30 71
3 in.	24 48	40 16
$3\frac{1}{2}$ in.	29 44	48 30
4 in.	34 88	57 23

Lapweld

2 in.	13 32	20 91
$2\frac{1}{2}$ in.	19 31	31 30
3 in.	25 25	40 93
$3\frac{1}{2}$ in.	30 36	49 22
4 in.	35 97	58 32
$4\frac{1}{2}$ in.	45 72	71 76
5 in.	53 28	83 62
6 in.	69 12	108 50
7 in.	92 82	146 40
8 in.x25 lbs. per ft.	97 50	153 80
8 in.x28 lbs. per ft.	112 30	177 10
9 in.	134 60	212 20
10 in.x32 lbs. per ft.	124 80	196 80
10 in.x40 lbs. per ft.	160 70	253 40

Ontario list—All points from Kingston and west to, but not including, Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
$\frac{1}{4}$ in. and $\frac{3}{8}$ in.	$ 2 46	$ 4 17
$\frac{1}{2}$ in.	3 06	4 80
$\frac{3}{4}$ in.	3 57	5 92
1 in.	5 27	8 76
$1\frac{1}{4}$ in.	7 13	11 85
$1\frac{1}{2}$ in.	8 53	14 16
2 in.	11 47	19 06
$2\frac{1}{2}$ in.	18 14	30 13
3 in.	23 72	39 40
$3\frac{1}{2}$ in.	28 52	47 38
4 in.	33 79	56 14

Lapweld

2 in.	$ 12 95	$ 20 54
$2\frac{1}{2}$ in.	18 72	30 71
3 in.	24 48	40 16
$3\frac{1}{2}$ in.	29 44	48 30
4 in.	34 88	57 23
$4\frac{1}{2}$ in.	44 45	70 49
5 in.	51 80	82 14
6 in.	67 20	106 60
7 in.	90 44	144 00
8 in. x 25 lbs. per ft.	95 00	151 30
8 in. x 28 lbs. per ft.	109 40	174 20
9 in.	131 10	208 70
10 in.x32 lbs. per ft.	121 60	193 60
10 in.x40 lbs. per ft.	156 60	249 30

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$33 00
Open-hearth billets, Pittsburgh	35 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	50 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 20	$3 15
Cut nails	3 15	3 20
Miscellaneous wire nails	75 per cent.	
Pressed spikes, $\frac{5}{8}$ diam., 100 lbs.	3 75	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	65
Stove bolts	75
Plate washers	$32\frac{1}{2}$
Machine bolts, $\frac{3}{8}$ and less	$57\frac{1}{2}$
Machine bolts, 7-16 and over	$47\frac{1}{2}$
Blank bolts	$47\frac{1}{2}$
Bolt ends	$47\frac{1}{2}$
Machine screws, iron, brass	35
Nuts, square, all sizes	3c per lb. off
Nuts, hexagon, all sizes	$3\frac{1}{4}$c per lb. off
Iron rivets	60
Boiler rivets, base, $\frac{3}{4}$-in. and larger	$4.10
Structural rivets, as above	4.00
Wood screws, flathead, bright	85 p.c. off
Wood screws, flathead, brass	50 p.c. off
Wood screws, flathead, bronze	45 p.c. off

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 25	$17 25
Copper, crucible	20 50	20 50
Copper, unch-bled, heavy	20 25	20 25
Copper wire, unch-bled	20 25	20 25
No. 1 machine compos'n	16 00	16 00
No. 1 compos'n turnings	13 50	13 50
No. 1 wrought iron	11 75	11 00
Heavy melting steel	9 00	10 00
No. 1 machin'y cast iron	14 75	14 00
New brass clippings	13 25	13 25
No. 1 brass turnings	11 00	11 00
Aluminum	32 00	31 00
Heavy lead	6 00	6 00
Tea lead	5 00	5 00
Scrap zinc	14 50	14 50

COKE AND COAL

Solvay Foundry Coke on application.

Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	20%
At warehouse	10%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS

Solder, half-and-half	0.24½
Babbitt metals	.11 to .60
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	11.45
Red dry lead, 100-lb. kegs, per cwt.	11.50
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.28½
Benzine, single bbls., per gal.	0.28
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	1.02
Linseed oil, boiled, single bbls.	1.05
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	5.50
Lead Wool, per lb.	0.11
Pure Manila rope	0.20
Transmission rope, Manila	0.24
Drilling cables, Manila	0.22
Lard oil, per gal.	1.28
Union thread cutting oil	0.54
Imperial quenching oil	0.38

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 40%

PROOF COIL CHAIN.

¼ in.	$7.85
5-16 in.	6.50
⅜ in.	5.75
7-16 in.	5.55
½ in.	5.35
9-16 in.	5.35
⅝ in.	5.20
¾ in.	5.10
⅞ in.	4.95
1 inch	4.80

Above quotations are per 100 lbs.

TWIST DRILLS.

	%
Carbon up to 1½ in.	55
Carbon over 1½ in.	25
High Speed	
Blacksmith	55
Bit Stock	60 and 5
Centre drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$3 75
Canada plates, dull, 52 sheets	4 00	4 00
Canada Plates, all bright	5 25	5 25
Apollo brand, 10¾ oz. galvanized	6 75	6 75
Queen's Head, 28 B.W.G.	7 25	7 25
Fleur-de-Lis, 28 B.W.G.	7 00	7 00
Gorbal's Best, No. 28	7 25	7 25
Viking metal, No. 28	7 00	7 00
Colborne Crown, No. 28	6 75	6 75
Premier No. 28, U.S.	6 25	6 15
Premier, 10¾ oz.	6 90	6 80

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$17 00	.....
1¼ in.	17 00	.....
1½ in.	17 00	11 55
1¾ in.	20 00	11 55
2 in.	20 00	11 00
2¼ in.	22 00	12 10
2½ in.	24 00	14 15
3 in.	32 00	14 60
3½ in.	35 00	18 00
4 in.	40 00	23 00

Prices per 100 feet, Montreal and Toronto.

WASTE.

WHITE.	Cents per lb.
XXX Extra	.15¼
Grand	.14
X L C R	.12¾
X Empire	.11½
X press	.10¼
COLORED.	
Lion	.09
Standard	.08
Popular	.07
Keen	.06
WOOL PACKING.	
Arrow	.20
Axle	.14
Anvil	.10
Anchor	.08
WASHED WIPERS.	
Select White	.09
Mixed Colored	.07
Dark Colored	.05½

This list subject to trade discount for quantity.

BELTING RUBBER

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble, 40 & 10%	
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B.B

⅛ in.	$14.00
3-16 in.	10.45
¼ in.	7.15
5-16 in.	5.65
⅜ in.	4.60
7-16 in.	4.60
½ in.	4.60
⅝ in.	4.45
¾ in.	4.45

Prices per 100 lbs.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy	.35
Copper sulphate	.22
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.32 to .33
Tin	.48 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs	.07 to .08
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., Feb. 12, 1916.—Industrial conditions continue to show unabated pressure in all directions. Considerable impetus has been given to the shell-making industry over the placing of an order for a further supply of 18-pdr. British shrapnel shells. Despite the improbability of additional orders for 18-pdr. high explosive shells, prospects of increased business in other lines are very encouraging, and will help to allay recent impressions that the supply of munitions was accumulating at such a rate that the production in Canada might have to be curtailed.

The present international crisis has brought about many changes in industrial affairs, not the least being connected with the production of certain materials which up to a year and a half ago were considered as belonging to certain countries or individuals. A case in point is that of Great Britain, who, while controlling half the world's production of tungsten ore, was wholly dependent upon Germany for tungsten metal. During the past year Great Britain has created facilities, and is now producing all the metallic tungsten required from Burmese and Australian ores.

Present indications are that the nickel refining industry in Canada will be developed along lines more beneficial to this country than the past.

The activity of Canadian agents in acquiring foreign trade is beginning to bear fruit. Several lines of machinery which had previously been imported from Germany are now being manufactured in this country. Several large wire looms have been constructed during the past year by a Montreal firm, and further orders are pending. Much anxiety in shipping circles is being experienced, owing to inadequate tonnage of ocean transportation. Many shipbuilding firms are contemplating increasing their facilities for the coming season, to accommodate the demands of prevailing conditions, which are likely to continue for an indefinite period.

Pig Iron

The market is comparatively quiet. As most of the requirements for first and second quarters have been covered, many are figuring on the placing of orders for their last half supplies, but in some instances buyers are not anxious to get into the market. No English pig iron is available on the Canadian market, as the supply is not sufficient to meet their own needs. Some of the large furnaces in Canada that are producing pig are not putting it on the market, but using it for their own steel requirements. Considerable interest is being manifest in the increased demand for foundry iron, and the prospects for continued activity in this direction are very promising.

Steel

Little change is noted in the steel situation; in fact, the conditions are such that it would be almost impossible to predict a change, unless something remarkable was to happen. Many of the large mills are virtually out of the market for the remainder of the year, the orders on their books being sufficient to maintain a capacity output for the balance of 1916. With the large tonnages daily leaving the country it is practically impossible for consumers and small dealers to secure sufficient steel to cover their requirements, and they are little better off now than they were some months ago, even with many of the mills producing more than their scheduled rating. Just what the bookings are for foreign delivery it is impossible to determine, but the impression is that the total amount must be very large. Under these abnormal conditions and the higher prices offered for war steel, the domestic trade must naturally suffer, and when it comes to the point where producers have to choose between profitable war business and that of general domestic customers, at a much lower figure, the choice is usually made where the home buyer has to suffer.

These conditions along with the constant rise in price of raw materials have likewise affected all other branches of the steel trade. Wire nails, rods, bolts, etc., have all followed the general trail, and advances are evident almost every week. The galvanized trade has not been very active of late, but improvement is expected, and it is anticipated that early quotations will show an advance. Black sheets are in good demand, and prices are very firm. The high-speed steel situation is still acute, and no definite price can be quoted, but the normal price might be stated as between \$2.50 and \$3 per lb.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion \$100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Metals

The feeling that was prevalent a few months ago that the high price of copper was due largely to misrepresentation on the part of producers, and apparent speculation of large buyers, is being replaced by the realization that a serious shortage is not only possible, but altogether probable. This impression is so strong that consumers are becoming nervous, and are trying to cover their requirements as early as possible. Even with the large increase in production during the past year the abnormal demand is so enormous that an actual famine seems not unlikely.

The situation in tin shows little change, and nothing of interest has developed during the week. An unlooked-for demand for lead at the present time would develop a situation similar to that prevailing in copper. In view of present conditions higher prices are expected.

Copper.—Copper is apparently being absorbed at enormous rates at the present time, and the demands upon producers are far beyond the capacities of the smelters. Early delivery is almost an impossibility, and March, April and May metal is commanding premium prices, and dealt with under special conditions.

Deliveries for February and March electrolytic have sold at 27½c, and some spot carloads at 28 cents (New York). The requirements for war supplies are so enormous that the consumption of copper is greater than the industrial world has ever before experienced. However, even at present prices of all kinds of copper, buyers are still anxious to cover their needs.

Montreal prices have again advanced, and are now quoted at 30 cents for lake and electrolytic, while castings have advanced .02 cents a pound, dealers now asking 29 cents.

Tin.—During the early part of the week the market was dull and quiet, but recent inquiries and demands for immediate and near future delivery have added considerable strength to an otherwise uncertain situation. The present requirements appear to indicate a much stronger tone and further advances may be looked for.

With the supposition that certain leakages are taking place, a report is abroad that the British Government are contemplating prohibiting Eastern export to neutral countries, so as to better control the Eastern output and enable them to keep a larger stock on hand available for possible contingencies. Local dealers,

following the advance in foreign markets are quoting tin at 46 cents, being an increase of ½c per lb.

Spelter.—The present situation is firm, with slight advances noted in foreign markets. Due to increased inquiries for early shipment and severe floods in the Joplin district (which has materially checked the production of the necessary ore), the tone of the market is much stronger. The demand for galvanized sheets continues light, and it is estimated that the requirements of spelter for this branch of industry do not exceed 50 per cent. of normal. However, it is not improbable that quotations may show an advance in the near future. Dealers are quoting last week's price of 22 cents.

Lead.—The market continues strong, with a higher tendency. The demand is still very good and in some instances where consumers have been compelled to cover their needs substantial premiums have been paid. This also applies in the case of considerable export shipment. The situation as regards foreign demand is very indefinite, as little reliable information is available, but is generally conceded that the foreign requirements are as heavy as at any previous time. The supply at the present is sufficient to meet all normal demands. Local quotations remain unchanged at 8 cents per pound.

Antimony.—Dealers report the market in a fair condition. The demand for early delivery has created considerable inquiry for futures; but with a fair supply in sight, it is expected that the present tension may be shortly relieved. Local prices are firm and unchanged at 50 cents.

Aluminum.—The market is steadier than of late, but conditions are otherwise unchanged. A shortage in raw material has temporarily strengthened the market, but dealers here are holding firm, with prices unchanged at 68 cents a pound.

Machine Tools and Supplies

The machinery market is gradually becoming more settled, as the bulk of the war orders for necessary machinery have been completed. Some of the plants manufacturing war supplies have added a few machines to increase the facilities of production.

Reports are abroad of foreign agents placing orders for large quantities of machine tools. The domestic demand, while not very great, shows signs of improvement, and the outlook seems encouraging for the coming year.

The manufacturers of small tools, such as twist drills, reamers, milling cutters, etc., are being flooded with orders and inquiries, and the demand is so strong that in many instances customers must content themselves with quantities much less than their requirements. Certain tools, such as high-speed twist drills, are now selling at six times their normal value. All quotations on tools and supplies are nominal and subject to change without notice.

Old Materials

The general situation in scrap metals is exceptionally strong at the present time, and the market is quite active. Heavy melting steel scrap is quiet, but firm. The trade in old copper is very good, and an advance of $2 a ton is quoted, present prices being: Light, $17,-25; crucible, $20.50; heavy and wire, $20.25; No. 1 machine composition, $16; composition turnings, $13.50 (an advance of 1 cent a lb.). New brass clippings and brass turnings, also scrap zinc have each advanced $2 per ton, and are now quoted at 13¼, 11 and 14½ cents a lb. respectively.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

Toronto, Ont., Feb. 15.—The steady increase in cost and growing scarcity of steel is exerting a widespread influence and causing considerable uneasiness in engineering circles. A large number of products composed either wholly or partly of steel are being affected with the result that prices are advancing and deliveries getting more backward. The ingot metal markets are again strong, and higher levels for copper, tin, spelter and antimony have been registered. Cost of production is increasing and there is a general upward tendency in price for practically all finished and semi-finished products. There is no prospect of the market weakening for some time to come, and there is no doubt that prices will advance to considerably higher levels than prevail at the present time. A number of price changes have been made during the week affecting boiler plates, pressed steel spikes, galvanized sheets, chain, billets, plate washers, copper rivets, scrap copper, brass, etc. Makers of machine tools are also advancing prices on account of increase in cost of production.

The industrial situation continues to improve due to the activity resulting from war orders and also by reason of a better domestic demand. Financial conditions are also improving and there is a more optimistic spirit in business circles. Although there will be far less money expended on civic works this year than in normal times, some municipalities are preparing to undertake improvements which are urgently required, makers of farm implements are looking forward to an active season as stocks of machinery in the West are low on account of the heavy demand due to the big crop last year. The situation as regards ocean freights does not improve to any great extent, and exporters are being seriously handicapped by the difficulty of obtaining tonnage.

Steel Market

The steel market is very strong and prices continue to steadily advance. The steel companies are getting so much business that they are further behind than ever on deliveries. The production of bars for shells is sold up practically for the rest of the year. The scarcity of steel is getting more acute and there is a great possibility of a famine in steel products. The supply of steel from the States is almost entirely cut off, throwing the entire demand in Canada on the Canadian mills, while in addition there is a large export demand. The announcement that the Canadian Car & Foundry Company will re-open the Welland plant is an indication that the domestic trade of Canada is getting back to more normal conditions. It is stated that the company has orders on the books to keep the plant operating a capacity for many months. The output will consist of reinforcing bars, flats and angles while, in addition, shell steel will be produced. The report for the past year issued by the Nova Scotia Steel & Coal Co. shows that this concern had a record year and has made large profits. The steel industry was never before in such a sound position. As already intimated, prices on a number of steel products have been advanced and include the following. Boiler plates ¼ to ½ in. have advanced 25c, and are now quoted at $3.20, with heads at $3.45 per 100 lbs. Tank plates 3-16 in. are now quoted at $3.55 per 100 lbs. Pressed steel spikes, ⅝ in. diameter are now quoted at $3.75 per 100 lbs. Higher prices have been announced for proof coil and electric

weld coil chain. The new discount on plate washers is 32½ per cent.

As was generally anticipated, prices of galvanized sheets have advanced and the market is very firm. The situation continues irregular and uncertain as a result of conditions in the spelter market and steady increase in cost of black sheets. Galvanizing plants in the States are still operating at considerably reduced capacity owing to the unfavorable conditions prevailing in the trade. Apollo sheets 10¾ oz. are now quoted at $6.75.

The large steel mills in the States are sold up on heavier products for the rest of the year and some business has been booked for plates and shapes for the first quarter of 1917. The United States Steel Corporation reports unfilled orders on hand on Jan. 31st at 7,922,767 tons compared with 7,806,220 tons on Dec. 31st. The heavy demand for steel bars continues both for export and domestic consumption, and prices are largely nominal depending to a great extent on delivery. Wire rods are scarce and higher, $50 per ton having been offered for Bessemer or open-hearth rods for shipment in two to three months from date of contract. It is reported that a sale of 2000 tons of Bessemer rods was made recently by a Pittsburgh mill for export to Canada at $45 or higher. There is no improvement in the billet situation, and it is causing considerable anxiety to consumers. Open-hearth billets have advanced and are now quoted at $35 per ton Pittsburgh.

Pig Iron

The market is quiet but prices are firm and unchanged. The demand for steel making pig iron is heavy and there is some improvement in demand for foundry grades.

Old Materials

The situation in this market is unchanged. There is a good demand for copper and brass scrap, and prices are higher, being about 1½c per pound above last week's level. Business is fairly good for other metals and the market is firm.

Machine Tools

The situation in the machine tool market is unchanged, the demand being lighter but steady. Conditions in the States are affecting the local market. A number of important manufacturers in the States have advanced their prices 10 per cent. on nearly all machine tools. Prices now are approximately 25 to 60 per cent. higher than they were a year ago. Deliveries have improved but are still backward.

Supplies

The market is firm and prices continue to advance. Plumber's oakum is now quoted at 5½c per pound. The cheaper grades of babbitt metal are higher, the range now being 11c to 60c per pound according to mixture. The new discount on plate washers is 32½ per cent. Gasoline and benzine are unchanged, but higher prices may be expected any time as Canadian crude oil advanced 5c recently and is now quoted at $1.98. The linseed oil market is firm and prices unchanged at $1.02 for raw and $1.05 for boiled oil.

Metals

The influence of the London market is being felt locally and higher prices have to be noted for copper, tin, antimony and spelter. As regards copper, the situation is abnormal and there is little doubt that considerably higher prices will be reached. Tin at the present figures is reasonable, but may go higher as the market is affected by freight rates and insurance, the latter having recently gone up. Spelter as in the case of copper and tin advanced in London with the result that prices locally have advanced. The "Trust" price for lead is higher but local quotations are unchanged meantime. Antimony is higher and quotations nominal, while aluminum is firm at last week's figures. Solders are unchanged but firmer in sympathy with the tin market.

Copper.—The abnormal situation in the copper market continues and prices have again advanced. The advance in London caused a sensation in that market and was due to a scarcity of metal. No one can say where the market will stop but it is generally believed that prices will go considerably higher. Producers have practically control of the situation owing to the enormous demand which promises to increase rather than otherwise. Copper locally has advanced 2c and quotations are nominal at 30c per pound.

Tin.—The market is higher following an advance in London. Tin is reasonable at present prices but may go higher as insurance rates have recently been increased. There has also to be considered the possibility of shipments being lost at sea, although at the present time the visible supplies are fairly heavy. Tin has advanced 1c and is quoted at 46c per pound.

Spelter.—The market is firm and higher both in London and New York due to improved demand principally from the brass mills. Zinc ore is quoted from $95 to $118, Joplin, Mo. Spelter has advanced 1c and is quoted at 22c per pound.

Lead.—The market is quiet but firm at unchanged prices. The "Trust" advanced prices to 6.25c New York and the market is firm at that figure. Lead is quoted locally at 8c per pound.

Antimony. — The market is very strong and higher with prices nominal. Spot-metal is very scarce as is also March delivery. The demand has greatly improved, the Dominion Government having recently concluded a large purchase of Chinese antimony which has had the effect of strengthening the market. Local quotations have advanced 2c and antimony is quoted at 47c per pound.

Aluminum.—The market has strengthened by reason of a better demand but prices are unchanged at 68c per pound.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

CANADA FOUNDRIES & FORGINGS

THE annual meeting of the shareholders of Canada Foundries & Forgings was held at Brockville, Ont., on Feb. 9. The following were elected directors for the current year:—F. C. Billings, Hartford, Conn.; Henry Bertram, Dundas, Ont.; John H. A. Briggs, Brockville; F. D. Canfield, Jr., New York; John T. Dillon, Titusville, Pa.; Thos. J. Dillon, Welland; Hon. Geo. P. Graham; J. Gill, Gardner, Brockville; H. B. Hausser, Toronto; Clarence F. Smith, Montreal; Hon. W. J. Shaughnessy, Montreal; Wm. M. Weir, Montreal.

Wm. W. Weir was appointed president; J. Gill Gardner, vice-president, and John H. A. Briggs, secretary-treasurer.

The year was the most prosperous in the history of the company. A dividend of $96,000 was declared on common stock and $11,200 on preferred stock, both payable February 15. It is understood that a net balance was carried forward of $630,000, as compared with $15,463 a

year ago. This balance is, after writing off for depreciation, providing for bond interest and dividends on both the common and preferred. It would represent 64 per cent. on the common stock, making earnings at the rate of 74 per cent. for the year, before deducting the 10 per cent. dividend recently declared. The common stock of the company is $960,000.

TIN POSITION IMPROVES

THE "Ironmonger," London, Jan. 15, says: "The general position seems to be rather stronger than for the past month or two, but unless any more tin-carrying steamers are lost prices will probably keep steady during the remainder of the month, as there is no immediate prospect of any increase of the consuming demand, and the statistical position is not likely to show much alteration. There is a fair business doing with America, but there is no sign of any increased demand, as that country's needs are being met with a direct supply that is well sustained. The output of tin from the Federated Malay States for 1915 is given as 783,043 piculs, against 823,909 piculs in 1914, a decrease of 40,866 piculs, or 2,194 tons. This reduction and the lack of Chinese, Banca and Billiton supplies have had the effect of keeping prices as steady as they have been during the past year, and as there is not much prospect of any considerable increase of supplies from any of these sources there does not appear to be any possibility that values will fall away for months to come."

TUNGSTEN PRODUCTION AFFECTED BY WAR

THE European war is responsible for enormous foreign contracts for American machine tools. The demand for high speed tool steel has also increased amazingly. At the same time the supply of tungsten available in this country has been reduced 50 per cent. or more by the cutting off of importations from Europe, India and Australia. In round figures the world's production of tungsten ore is about 10,000 tons of which 4,500 tons are produced in India, 2,000 tons in Australia, and about 1,500 tons in Portugal. The embargo placed by the British Government against exports of tungsten ore and the English financial control of the Portugal deposits has prevented any importations into U.S. in the last year. The production in this country until recently has been 2,000 tons annually, most of which is produced in Colorado and California. Diligent search is now being made for new deposits in the far West and South. Some ore was recently discovered in Mexico. In the manufacture of tool steel about 15 to 20 per cent. of tungsten is used in the crucible process and about half this percentage in the electrical process. Tungsten ore some years ago was selling at $840 a net ton. More recently it has brought $3,000 per ton. Tungsten, the metal which sold at 75c per pound before the war has recently sold at $6 to $8 per pound.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Stratford, Ont.—R. M. Ballantyne Co. will make an addition to their power plant.

St. Catharines, Ont.—The Metal Drawing Co. will build an extension to their factory.

Toronto, Ont.—The Hamilton Gear & Machine Co. will build an addition to its plant, to cost $5,000.

Hagersville, Ont—Frank Tyrrel is receiving prices and information on woodworking machinery.

Toronto, Ont.—The Toronto Laundry Machine Co. will build an addition to its plant, to cost $2,800.

Toronto, Ont.—The Canada Pipe & Steel Co. will build an addition to its machine shop, to cost $3,000.

Broderick, Sask.—Robert Reid is in the market for a screw-cutting engine lathe, about 18-in. swing, gap bed.

Windsor, Ont.—The Universal Stove & Furnace Co. is considering the erection of a plant for the manufacture of stoves, furnaces, etc.

Montreal, Que.—The forge department of the Canadian Car and Foundry Co., was damaged by fire last Saturday to the extent of $50,000.

Markham, Ont.—The Hall Motors Co., have secured a plant here which will be equipped for making motor trucks. E. A. Hall is manager.

Montreal, Que.—P. G. Dunham, Windsor Hotel, will receive proposals for supplying one 200-h.p. engine and one 200-kw., 220-volt, direct-current generator.

Hespeler, Ont.—A. B. Jardine Co.'s plant, which was recently damaged by fire, will be rebuilt. Some of the machinery was badly damaged.

Vancouver, B.C.—Black Bros., Ltd., manufacturers of automobile tops and bodies, are in the market for a metal swedge or beader and carriage hub borer.

Port Robinson, Ont.—MacFarlane-Pratt-Hanley, Ltd., are in the market for 8 x 10-in. or 7 x 12-in. double hoist, double drum with ratchet, pall and brake straps with swinger attached.

Toronto, Ont.—The Property Committee of the Board of Education have decided to experiment with an oil-burning heating system. The experiment may be made in the Earl Grey School.

Vancouver, B.C.—Bids are being received for the construction of a 4-storey, 125 x 130-ft., addition to the plant of the American Can Co. Estimated cost, between $60,000 and $70,000. B. C. M. Bigger is manager.

North Vancouver, B.C.—The City Council have decided to submit a by-law to the ratepayers to guarantee the bonds of the Amalgamated Drydock and Engineering Co., to the extent of $750,000. This company will build a shipbuilding plant and drydock here, estimated to cost $5,500,000.

Sudbury, Ont.—The Sudbury Construction & Machinery Co. has commenced the construction of brick and steel extensions to its plant, to cost about $6,000, including an addition to the foundry, 30 x 40 ft., to be devoted to brass castings; the construction of a cupola house, 30 x 40 ft., and the installation of a furnace which will increase its capacity 50 per cent.

Niagara Falls, Ont.—It has been announced by an official of the Ontario Power Co. that work would be started early next spring on a third pipe line. The new pipe line will supply two additional units, increasing generating capacity of the plant to 180,000 horsepower. The pipe line will be about 6,000 feet in length and 18 feet in diameter. It will require all of two years to construct.

EQUIPMENT FOR AUSTRALIAN NAVAL DOCKYARD

Tender forms and specifications have been forwarded by D. H. Ross, Trade Commissioner, Melbourne, for 43 machines of various types required for the equipment of the Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W. Tenders will be received, subject to the conditions specified, up to May 1, 1916, addressed to the Director of Navy Contracts, Melbourne, Australia. The last mail in time to reach Melbourne on May 1 is that leaving San Francisco on March 22 and due at Melbourne on April 12. The tender forms are open to the inspection of Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer file No. A-1435). Particulars of the requirements are briefly outlined thus:

Three 50-ton overhead travelling cranes.

One 25-ton overhead travelling crane.

Two 5-ton overhead travelling cranes.

One 10-ton revolving cantilever crane.

Two 5-ton travelling portal jib cranes.

Two 7½-ton jib cranes.

One 5-ton jib crane.

Two 15-ton hydraulic cranes.

One 6-ton hydraulic crane.

One 6-ton wall crane (hydraulic).

Two 3-ton wall cranes (hydraulic).

Two electric passenger elevators.

Two electric goods elevators.

One 2½-ton gauge locomotive with crane attached.

One 2½-ton gauge locomotive without crane attached.

Three electrically-driven air compressors, 1,500 cu. ft.

One 15-ton hydraulic winch.

One 5-ton hydraulic winch.

Nine 10-ton hydraulic capstans.

Two 5-ton hydraulic capstans.

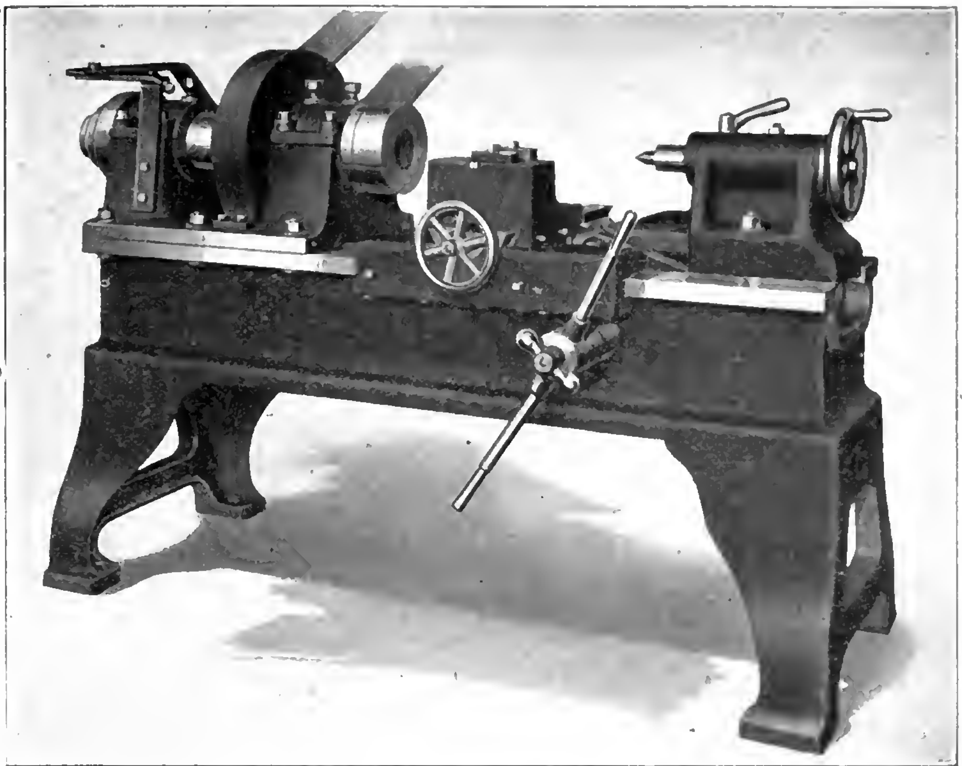
One bar shearing machine.

One double-ended horizontal punching machine.

One 10-ton overhead travelling crane for shipyard fitting shop.

The Hepburn Single Purpose Heavy Duty Shell Turning Lathe

(Patents Applied For)



This machine tool is an excellent example of speed, accuracy, power, strength and simplicity. Its new features—bronzed bearings, oil pan, felt wiper fitted in carriage and an increased proportion of working parts give you the service and quality idea that has been built into this lathe and insure its long and efficient use.

Drop us a card for specification and full details.

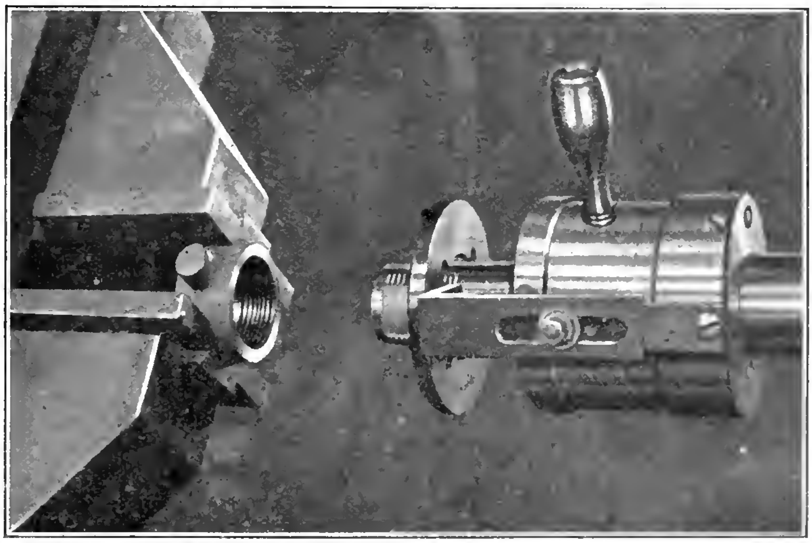
We can make delivery on Heavy Duty Turrett Lathes of same pattern.

The A. R. Williams Machinery Co. LIMITED

64-66 Front Street W., Toronto, Canada. St. John, N.B., Winnipeg, Vancouver.

IF IT'S MACHINERY—WRITE "WILLIAMS"

Let the Geometric Collapsing Tap Show You How



A Geometric Standard Tap on the Job

Universally adopted for tapping operations above ¾-inch diameter.
Fitted for Turret Head Machines or Live Spindles.

Send along your specifications and get our quotation.

THE GEOMETRIC TOOL COMPANY NEW HAVEN, CONN., U.S.A.

Canadian Agents: Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

E ectrical

Amherstburg, Ont. — Niagara power has finally been decided upon for Amherstburg, and within a short time a new street lighting system will be installed at a cost of $2,582.

Toronto, Ont. — The Bedford Park Ratepayers' Association have succeeded in getting the York Township Council to consider the installation of hydro lights on Bedford Park and Woburn avenues, and will, in accordance with the instructing of the hydro engineer, draw up a plan of the streets, which will be submitted to the township council at their next meeting.

Municipal

Montreal, Que.—The Board of Control will instal a sewage pump at Notre Dame de Grace.

Maillardville, B.C.—The city will instal a waterworks plant and system to cost $10,000.

St. Mary's, Ont.—The Town Council contemplate making extensions to the waterworks system.

Cooksville, Ont.—Toronto and Etobicoke Township ratepayers last Saturday voted in favor of Hydro-radial bylaws.

Ottawa, Ont.—The City Council have decided to make extensions to the water distribution system in various parts of the city.

Ford, Ont.—The Town Council contemplated making improvements to the street lighting system. A by-law will be voted on.

London, Ont.—The City Council have decided to instal an ornamental street lighting system on Talbot and King Streets at a cost of about $3,000.

New Toronto, Ont.—The waterworks system will be considerably enlarged to take care of the increased demand due to new factories locating here.

Lindsay, Ont.—The town council are considering the question of buying a motor truck for the fire department at a cost of about $1,200.

Tecumseh, Ont. — The Eau Claire Waterworks Co., which was recently incorporated, proposes to construct a waterworks system, estimated to cost $20,000.

Wellesley, Ont.—The council will shortly call for tenders for the construction of an electric distribution plant, to cost $7,500. P. F. Schummer, St. Clements, Ont., is town clerk.

Toronto, Ont. — Toronto Township ratepayers also voted favourably on a by-law granting the Credit River Works, Ltd., a fixed assessment for ten years of $10,000 on the Barberton Mills.

Stratford, Ont.—At a special meeting of the City Council last Friday the bylaw to guarantee the bonds of the proposed hydro radial from Toronto to London to the extent of $651,000 was given its third reading after brief discussion.

St. Mary's, Ont.—The ratepayers of the township of Blanshard, one of the few municipalities which defeated the Hydro-Radial by-law in January, will vote on it again, the township council deciding to re-submit the proposal on March 13.

Hamilton, Ont.—Following a decision of the Controllers to disfranchise the National Natural Gas Co. for not living up to its contract, Hamilton gets control of what will be the biggest coke plant in Canada. The United Gas & Fuel Company is behind the scheme, although Chicago is financing it.

Montreal, Que.—The Board of Control have instructed that plans be prepared for the construction of a hydro-electric power and pumping station to be built at the end of the aqueduct canal. It will have a capacity of 10,000 h.p., and will cost complete $1,500,000. Frederick E. Field, Atwater Avenue, is the engineer.

St. Mary's, Ont.—The town council have refused to pass the final reading of the agreement between the town of St. Mary's and the Hydro-Electric Commission of Ontario, known as the Hydro-Radial by-law, by the casting vote of the mayor, Mr. Weir, who claims that he was acting on the advice of his legal adviser.

Waterloo, Ont.—At a prolonged session of the town council on Feb. 8, the motion to give the third reading to the Hydro-Radial railway by-law was defeated by a vote of 5 to 4. The majority of the councillors were not satisfied with the assurances that have been given by Sir Adam Beck that the route to be selected through Berlin and Waterloo would be satisfactory to both municipalities.

General Industrial

Wyoming, Ont.—Efforts are being made to establish a clothing factory here.

Toronto, Ont.—Fire at the Ideal Bedding Co.'s factory on Jefferson avenue, caused damage estimated at $3,000.

Montreal, Que.—The Gold Medal Furniture Mfg. Co., suffered a loss of $15,000 on Feb. 8, by fire, smoke and water.

Grand Falls, Nfld.—The Harmsworth paper plant, operated by the Anglo-Newfoundland Development Co., was damaged by fire Feb. 3 with a loss of about $100,000.

Edmonton, Alta. — The three-storey plant of the Emery Mfg. Co., engaged in the manufacture of overalls, dresses, etc., was destroyed by fire on Feb. 7. The loss is estimated at $100,000.

Campbellford, Ont.—Fire on Feb. 13, at the Northumberland Paper & Electric Co. building here, practically destroyed the whole plant. The loss is understood to be covered by insurance.

Toronto, Ont. — Architect T. J. Hepburn is calling tenders for the erection of an addition to the Avon Hosiery factory on Erie street. It is expected that an addition will be built extending the present building 60 feet to the back of the lot. The addition will be three storeys high with basement.

Trade Gossip

The Alton Foundry Co. have increased their capital stock to $100,000.

The Canadian Ice Machine Co., Toronto, have been awarded the contract for the supply and installation of an addition to the cold storage plant at the Municipal Abattoir, Toronto, Ont.

Quebec, Que.—The Minister of Colonization and Mines has introduced a bill before the Legislative Assembly to encourage the development of the mining industry in the Province of Quebec.

Charters Surrendered—The following companies have surrendered their Ontario provincial charters: Norfolk Gas Co., Enterprise Gas Co., Port Rowan Natural Gas Co., Michigan Cobalt Mines Co.

The Maxwell Motor Co., will build a factory at Windsor to cost about $65,000. The initial plant will have a floor area of 30,000 square feet and seven acres of ground have been secured to permit of future extensions.

Preston, Ont.—At a meeting of the Board of Trade the following officers were elected for the ensuing year: President, M. H. Mullin; vice-pres., R. A. MacGillivray; secretary, C. G. Robertson; treasurer, A. L. Amys.

Waterloo, Ont.—At a meeting of the Board of Trade held recently, the following officers for the year were elected:—President, P. V. Wilson; 1st vice pres.,

H. M. Snyder; 2nd vice pres., J. R. Kaufman; sec.-treas., W. S. Naylor.

The Ontario Metal Products Co., Toronto, have taken over the building which extends back from 50 Pearl Street, to Adelaide Street. It is the intention to enlarge same with a view to further business development.

Prescott, Ont.—At a meeting of the Board of Trade, the election of officers resulted as follows: President, P. Kingston; 1st vice-president, J. P. Dunne; 2nd vice-pres., T. H. Pringle; secretary, W. F. Macpherson; Treas, H. P. Bingham.

The Globe Electrical Machine Co.—Hamilton, Ont., have removed to larger premises in Mary Street where additional equipment has been installed for the manufacture of cutting off machines, turret lathes and special machinery for shell manufacture.

Canadian Patriotic Fund—Vanadium-Alloys Steel Co., Pittsburgh, Pa., used Canadian Machinery and Manufacturing News as its medium in transmitting two cheques of $250 each to the Toronto Headquarters of the Canadian Patriotic Fund a few days ago.

Niagara Falls, Ont.—The Board of Trade has reorganized by electing former Mayor C. C. Cole president for the third consecutive time. A Civic Improvement Committee has been added to the list of committees, and J. C. Gardner has been made its chairman.

Toronto, Ont.—The appropriations in the Dominion Government's estimates for Toronto for this year include $210,000 towards a federal building, $600,000 for harbor improvements, $455,000 for a postal station, $500,000 for a Customs building and $97,000 for post offices on Queen St, and Spadina Ave.

Regina, Sask.—W. G. Styles was elected president of the Regina Board of Trade at the annual meeting held recently. E. A. McCallum is first vice-president, and N. J. Rutledge, second vice-president. Commissioner McDonald was re-elected secretary-treasurer. The newly-appointed council will consist of thirty-four members, eleven of whom were not on the 1915 board.

The International Time Recorder Co., Binghamton, N.Y., has formed a separate corporation in Canada to be known as the International Time Recorder Co., of Canada, which has purchased the W. A. Wood Co. plant at Montreal. It will also establish a factory at Toronto, about April 1, for the manufacture of time clocks, recorders, etc. J. E. Rogers has been elected president and F. E. Millen, general manager.

Hudson Bay Railway.—According to a reply in the Commons on Feb. 8, by Hon. Frank Cochrane to a question by J. H. Sinclair, nearly $15,000,000 have already been spent on the Hudson Bay Railway project, and it will take at least another $10,000,000 to complete the undertaking. On the railway itself $9,557,340 have been spent, while over $5,000,000 have been spent in dredging, lighting and other improvements at Port Nelson.

The Canadian Meter Co., of Hamilton, Ont., which is now operating under a provincial charter, is seeking incorporations under the Dominion Companies Act. The applicants are John Berthlone McNary, E. H. Ambrose, J. R. Marshall, Stanley Rowland Jefferess and Clarence H. W. Grace, of Hamilton. The business of the present company will be taken over as a going concern, but incorporation under the Dominion act will give the company increased powers.

York County Roads.—The improvement of 210 miles of roads at an expenditure of between $700,000 and $800,000 within the next four years is the comprehensive good roads scheme decided upon by a committee of the York County Council, and recommended to a special

session of the council, to be held to-day. The roads to be improved all run north and south through the county, and are known as the Weston, Vaughan and Kennedy roads and Yonge street.

Toronto, Ont.—The entire common stock of the West Kootenay Light & Power Co. will be purchased by the Consolidated Mining & Smelting Co. Shareholders of the latter company met here on Feb. 7, and ratified the project. The West Kootenay Light & Power Co., Ltd., has a capitalization of $2,500,000, of which $2,000,000 is common stock, fully paid up, par value $100 per share. The common stock has been paying 5 per cent. Directors of Consolidated Mining & Smelting Co. are: W. D. Matthews, president; George Sumner, vice-president; Sir Edmund B. Osler, H. S. Osler, W. L. Matthews, Charles R. Hosmer, J. C. Hodgson, W. M. Farwell and J. J. Warren

U.S. Copper Production. — The Engineering and Mining Journal reports the production of refined copper in the United States in 1915 as having been 1,652,775,822 pounds. Stock on hand Dec. 31, 1914, was 162,566,683 pounds; on Dec. 31, 1915, 84,666,380 pounds, as per following table (in pounds):

	Supplies	Production	Stock, Dec. 31
Year 1915	1,776,250,869	1,652,775,882	84,666,380
Year 1914	1,492,843,502	1,533,781,394	162,566,683
Year 1913	1,649,430,326	1,622,450,829	91,438,867

Winnipeg, Man.—Another big change in the Shoal Lake water district plans has been decided on. It is that the site of the 250,000,000 gallon reservoir near Transcona that will cost over $300,000 will be shifted two miles south of the first planned location and to a point 6,394 feet further from Winnipeg. In addition the three consulting engineers from New York and Boston have all agreed that it would be best to now change the Transcona-Red River pipe line to concrete instead of steel as originally suggested. The water board nevertheless have issued instructions for an estimate of the cost of a cast iron pipe between these two points.

Personal

F. S. Lewis, managing director of the Tudhope-Anderson Co., of Orillia, Ont., has been elected president of the Board of Trade in that town.

Asa S. Cook, president of the Asa S. Cook Co., manufacturers of automatic wood screw machines, of Hartford, Conn., died on Jan. 16.

Major F. H. Deacon, of Toronto, president of the John Morrow Screw & Nut Co., Ltd., Ingersoll, Ont., has been appointed inspector of supplies for Military District No. 1, at London, Ont.

Sir Charles Rivers-Wilson, K.C.M.G., former president of the Grand Trunk Railway, died in London, England on Feb. 9. Sir Charles was born in England in 1831, and entered the British Treasury in 1856, having a distinguished career as a financier. He was president of the G. T. R., from 1895 to 1909.

S. A. McGaw, who was general manager of the Western Canada Flour Mills, Winnipeg, Man., for the past ten years, died at Los Angeles, Cal., on Feb. 9, as a result of an automobile accident. The deceased only retired from business a few weeks ago, and was taking a holiday.

George Stark, of Woodside's Foundry, Port Arthur, Ont., has been appointed manager of William Kennedy & Sons' new machine shop at Owen Sound, Ont.

F. W. Harrison, president of John Harrison & Sons, Co., sash and door manufacturers, Owen Sound, Ont., died on Feb. 9.

J. H. McKechnie, president of the Canadian Consolidated Rubber Co., died at his residence, Montreal, on Feb. 8. The deceased was born at Granby, Que., 66 years ago, and assisted in organizing the Granby Rubber Co., which eventually amalgamated with the Consolidated Rubber Co., of Montreal. Mr. McKechnie was elected president of the company in April, 1915.

Tenders

Ottawa, Ont.—Tenders will be received until Feb. 29, for the supply of waterworks materials for this year. Particulars can be obtained from R. L. Haycock, waterworks engineer.

Montreal, Que.—The Board of Control have decided to call for new tenders for a supply of 6,000 tons of asphalt, replacing the former call, which was illegal, due to a mistake in the preparation of the advertisement. Tenders close on March 2.

Ottawa, Ont.—Tenders will be received by the secretary of the Water Works Committee, up to February 24, 1916, for brasswork, cast iron pipe, lead pipe and pig lead, oils and grease, special pipe castings or valves. Specifications, form of tender and full particulars may be obtained on application to the city engineer's office, city hall, Ottawa.

Toronto, Ont.—Tenders will be received by the Chairman, Board of Con-

trol, City Hall, up to Tuesday, March 14, 1916, for the supply and delivery of: One single-truck, double-end street car, completely equipped; one car body, double-end, single-truck; equipment for one single-truck; equipment for one single-truck car. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Ottawa, Ont. — Tenders will be received up to March 1, 1916, for:—1. The construction of a pumping station and electric sub-station on Lemieux Island, for the City of Ottawa. 2. The manufacture, delivery and installation of:— (a) main piping, valves and specials. (b) Heating and plumbing. All for the above Stations. Plans and specifications may be seen at the office of the engineer, John B. McRae, 310 Booth Bldg., Ottawa.

Collingwood, Ont. — Tenders will be received by the chairman of the Collingwood Water & Light Commission until Wednesday, March 1, 1916 for the following works:— (1) Steel water tower. (2) Foundation for steel water tower. (3) Pumping machinery, comprising one motor-driven unit of 800 Imperial gallons capacity. (4) Pump well and connections. Plans and specifications may be seen at the office of the Engineers Chipman and Powers, 204 Mail Building, Toronto, or at the Water and Light Office, Collingwood.

Ottawa, Ont.—Tenders will be received until Monday, February 28, 1916, for the construction of timber lock gates and their equipment for the East River Lock, near New Glasgow, Pictou County, N.S. Plans and forms of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the district engineers at Antigonish, N.S.; Halifax, N.S.; Shaughnessy Building, Montreal, P.Q.; Confederation Life Building, Toronto, Ont., and on application to the postmaster at New Glasgow, Nova Scotia.

Hamilton, Ont.—Tenders will be received up to Wednesday, March 1, 1916, for supplying the corporation of the City of Hamilton, with the following:—Castings (ordinary and special), iron pipe, hydrants, valves, extension boxes, lead pipe, pig lead, rubber hose, rubber boots, road oil, lubricating oil, flux, fuel oil, coal oil, gasoline, concrete and garbage duck covers, bass brooms, sectional sweepers, brass work, including ordinary and special brass castings for water department, hardware. Specifications and form of tender for all of the above can be obtained at the office of the city engineer, Hamilton, Ont.

Contracts Awarded

Niagara Falls, Ont.—Contract awarded to Gartshore-Thompson Pipe & Foundry Co., Hamilton, for the supply of cast iron pipe.

Owen Sound, Ont.—The Meaford Wheelbarrow Co. has received an order for 50 field kitchen for the use of the Canadian overseas force.

The S. F. Bowser Co., of Toronto, has been awarded the contract by the Toronto board of control for the installation of 10 standard gasoline equipments at city fire halls, at a cost of $1,780.

Classified Advertising Section

Classified Advertisements

Rates (payable in advance):—2c per word first insertion, 1c per word subsequent insertion. 5c additional each insertion when Box Number is required. Each figure counts as one word.

FOR SALE

18 IN. x 10 FT. BRADFORD LATHE AND countershaft, also 18 in. x 8 ft. Lodge & Shipley, both in splendid condition; immediate delivery. Box 172, Canadian Machinery. (8)

FOR SALE—CINCINNATI ENGINE LATHE, 18" x 6'; taper attachment, hollow spindle, quick-change gears, compound rest, two chucks; also 12 H. P. gas or gasoline engine. Apply Wheeler Needle Works, Paris, Ont. (7)

MACHINE SHOP WITH MACHINERY, garage and house, on nine thousand four hundred feet land, with adjacent vacant twenty-eight thousand feet; next railway station; good site; good accommodations; twenty miles from Montreal; immediate possession; bonus expectation to big concern. Box 173, Canadian Machinery. (6)

TURRET LATHES FOR SALE—3—2 x 24 Jones & Lamson Turret Lathes, $500.00 to $600.00 each. 3—19" swing Jones & Lamson Turret Lathes, fitted with Diamond Turret. The above machines are in good condition, also 2 Small Turret Machines, 1¼" hole in the Turret Head. Apply to A. B. C., Box 171, Canadian Machinery. (6)

Corporation of Paisley Electricity Department

The above Corporation have for disposal one horizontal cross compound steam engine, as follows:—

Speed=90 revs. per minute.

Diameter of H.P. Cylinder=24 inches.

Diameter of L.P. Cylinder=48 inches.

Steam pressure=150 to 175 lbs. per sq. in.

Fitted with coreless valve gear.

Weight of Flywheel=about 20 tons.

Makers: Daniel Adamson & Co., Ltd., Dukinfield.

The lowest price that will be considered for the Engine will be £2,000. This may be inspected by arrangement at the Works, Blackhall Street, Paisley, and all enquiries should be addressed to the undersigned.

C. F. Parkinson
Engineer and Manager
Blackhall Street, PAISLEY

FOR SALE—INGERSOLL-RAND CLASS NE-1 power-driven, single-stage, straight line air compressor, close connected for belt drive to motor. Piston diameter 12 inches. Piston displacement 258 cubic feet per minute. Designed for pressure, minimum 35, maximum 55, lbs. per square inch. Length 7' 6". Width 3'. Height 4' 3". Been used for 4 weeks only. Box 160, Canadian Machinery. (8)

SITUATIONS VACANT

JUNIOR DRAFTSMAN, EXPERIENCE ON structural work an advantage; permanent position to right man; give fullest possible particulars. Box 174, Canadian Machinery. (7)

WANTED — MACHINISTS AND FLOOR hands on heavy and miscellaneous medium work; steady employment, modern shop, good wages. Apply, stating age and experience, P.O. Box 6, Walkerville, Ontario. (6)

AGENCY WANTED—A FIRM IN ENGLAND is desirous of securing the sole agency for Great Britain for twist drills, taps, stocks, dies, reamers, milling cutters, etc. Please communicate full particulars to Box 175, Canadian Machinery.

MACHINE TOOL SALESMAN WANTED BY a well-known and progressive manufacturer of a high-grade line of grinding machines. Thorough mechanical training with selling ability necessary. Give full particulars as to experience, age, salary expected, etc. Box 170, Canadian Machinery. (42)

Sell Your Scrap Materials Direct to the Wholesaler

Get our quotations before selling. We are wholesale dealers in all grades of Scrap Iron Shrapnel turnings and borings, Scrap Copper Brass, etc. This week we are paying 27 cents per pound for Scrap Aluminum.

Send for our monthly price list. Our Motto, "Honest dealings and prompt settlements."

L. S. Tarshis & Son
88-92 Wellington St., Montreal

FOR SALE

One New Holden-Morgan

Thread Milling Machine

For Threading Nose 4.5 H.E. Shells either 2 or 2½"—14 R. H. Thd.

Immediate delivery
Subject to prior sale.

Write or wire for prices and particulars if interested.

T. McAvity & Sons, Ltd.
ST. JOHN, N.B.
[7]

MANUFACTURERS' AGENTS—IMPORTANT Sheffield (England) firm actually manufacturing high speed steel, twist drills, milling cutters, etc., carbon steel, mining drill steel, shear blades, etc., requires a live firm to act as representatives for this part of Canada, at end of war. Write stating experience of above lines, agency conditions, mode of handling the agency, etc., in confidence, to Box 811, Dorland Agency, Ltd., 16 Regent St., London, S.W., England. (8)

WANTED—FOREMAN FOR BOILER SHOP—must be a good executive in handling work and men. Quick, active, strictly temperate and disciplinarian. Able to lay out work for general construction of tanks, plates, jobbing and marine repair work. Must be able to train men in economical and systematic methods. Shop employs about forty men (Spanish-American). Preferably a married man wanted. State age, experience and salary expected. P. O. Box 410, Havana, Cuba.

WANTED—ASSISTANT FOREMAN FOR machine shop, working on shells; must be a thorough mechanic with previous experience on the larger sized shells and able to take full control of shop employing up to a hundred men. Apply giving full particulars as to experience, with whom previously employed, age, and salary expected, and enclose copies of references. Only those giving full particulars in the first instance will receive consideration. Liberal remuneration to the right man. Apply in confidence to Box 165, Canadian Machinery. (6)

FOR SALE

6—2¼" Cleveland Plain Automatic Screw Machines.

American Machinery Exchange
Incorporated
251 CENTRE ST. - NEW YORK CITY

FOR SALE

Two 96-horse-power Gas Engines.

Complete with producers.

Made by the largest English manufacturers.

WILL SELL CHEAP

Empire Mfg. Co., Ltd.
London, Ontario.

To precede pp. 165

~~103~~

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, FEBRUARY 24, 1916 No. 8

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY

PETER BAIN, M. E., Editor.

Associate Editors.

A. G. WEBSTER. J. M. WILSON. J. H. RODGERS.

B. G. NEWTON - - - - - Advertising Manager

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—London, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 140 So. Dearborn St., Room 607, Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Opportunities for Canada's Industrial Development-IV.

By C.T.R.

In this series of articles prepared in response to numerous inquiries received from the managements of Canadian metal-working plants on the subject of post-bellum employment for their added equipment and enlarged capacity arising from an extended period of shell production, we aim to give prominence to the opportunity to manufacture such products as were previously imported for our domestic needs or have since become available for export.

THE general attitude of Canadian manufacturers as a whole towards export trade has at no time in the past been so vigilant as it is at present, nor so aggressive as it promises to be in the future. To those of us who have not heretofore contemplated carrying their efforts further afield, the trade possibilities offered by the various members of the British Empire are bound to appeal more forcibly than those pertaining to countries of alien nationality, customs, and language.

The medium of intercourse will always have a more or less restrictive influence on the expansive efforts of many of our manufacturers, which time and intercourse alone can modify, and the many difficulties in the way of attaining a desirable and necessary mutual understanding with foreign clients is bound to react in favor of trade with English-speaking peoples and others who already have intimate trade relations with Great Britain.

The Outlook For Others

Due largely to the geographical location of Canada, trade opportunities present a similar aspect to us as to our neighbors in the United States. The attitude of manufacturers in that country was well indicated at the recent Foreign Trade Convention held at New Orleans last month. Apart from the fact that the papers were contributed by leading men of the country, whose position and experience were sufficient to demand close consideration of their views, the subject matter discussed by them was in itself indicative of a final and permanent awakening to the necessity for organized effort by the various industries concerned. The need of foreign markets for the United States may be pressing as an ultimate factor in the economic life of that country, but events in Canada are proving every day that our own welfare demands that we also prepare for a similar subsequent development in our industrial history.

Supremacy Founded on Finance

That "Trade follows the flag" is an old saying founded on the manner in which the British Empire extended its sway and developed its commerce. Leaving the flag out of the question, the modern manufacturer, outside of England and Germany, must realize that "Manufactures follow the money."

The remarks of President Farrell, of the United States Steel Corporation, at the New Orleans Convention, indicate in a broad manner the principal conditions which have contributed to Britain's commercial supremacy, and, although spoken before American manufacturers, their applicability to Canadian trade conditions and prospects is very great. Regarding the foreign investment of American capital as an aid to their foreign trade, he said:—

"It will not be disputed that the more complex the form assumed by the industry of any people, the more rapid must be its increase in wealth. In other words, it would pay us better to convert our own raw materials into finished products here than to sell them for conversion abroad. But our advance in that direction will be relatively slow without a constantly broadening foreign outlook for articles of American manufacture.

"To attain the maximum efficiency for our factories and workshops, they must be operated at their full capacity. Hence, on this ground alone it is absolutely essential that we should insure against the consequences of recurring periods of domestic depression by cultivating foreign markets. It is thus as much in the interest of the workman as of his employer that provision should be made for the steady sale abroad of the products of the mechanical industry of the United States. It is in the interest of both that the capital needed in that industry should be obtainable on easy terms. But it has been shown that the condition and prospects of the foreign trade of a given industry are a factor of very considerable weight in determining the value of its securities. In fact, the foreign business of many corporations, since the war began, has been their greatest asset, and the only justification for the operation of their plants on full time."

As was pointed out by Mr. Farrell, these conditions in the States will cease after the war, just as they will here in Canada, and the ability of many plants in both countries to then dispose of their product will depend on something more tangible than ability to make deliveries. Trade conditions may occasionally be such that certain goods sell themselves, but only for part of the time. All of the time the great majority of manufactured products call for effort to secure their prompt and profitable disposal, and just as the members of any one industry acquire the knowledge of where, when, and how to sell their products, so will they build up permanent business in their particular lines.

Credit Necessary, Investment Desirable

All students of the situation are of one opinion regarding the influence of credit on foreign business. Credit, however, must not be confused with investment which as a national characteristic has been largely responsible for the foreign trade of Britain. Canada as a nation will not be in a position to assume the role of investor on a large scale for some years to come, but a few facts regarding Britain's financial relations with foreign countries will indicate the ultimate desirability of Canada becoming a creditor nation.

At the commencement of hostilities foreign countries were indebted to Great Britain to the extent of $20,000,000,000. Of this amount $9,240,000,000 was invested in British dominions, colonies and possessions, $3,160,000,000 in the United States, with the remaining $7,600,000,000 distributed among the rest of the world. The vast annual interest yielded by such a sum has never been entirely removed from its source, amounts ranging from $600,000,000 to $800,000,000 being reinvested annually, thus increasing the markets or more firmly securing the existing investments.

Other countries, notably Germany, followed Great Britain's example in thus securing foreign markets for their products, particularly in South America, but with the exception of certain enterprises on the west and north coasts, the United States has not figured as a national investor in South American countries. The error of this aloofness is at last dawning upon them, but so far little has been done in financing such countries as offer openings for investment.

Two Classes of Products

A consideration of the conditions involved shows that manufactures suitable for export can be divided into two groups, viz.—The ordinary articles of commerce which are distributed through dealers to individuals or corporate consumers who desire the best article for the price they are prepared to pay, and, secondly, machinery, equipment, raw materials and stores necessary for the development of extensive enterprises. Of the second group it can be truly said that manufactures follow the money, as the supplies required by this class are

frequently arranged with or form part of loan transactions. As such business is principally railroads, public work, steamship activity, or raw material exploitation on a large scale, the possibilities of Canadian trade expansion in that direction must, under existing conditions, be limited.

The similarity of conditions between the United States and Canada with respect to national influence in foreign trade renders enlightening a consideration of those methods which have enabled several large American corporations to extend their activities to every quarter of the globe.

Such lines as steel production, agricultural, machinery, sewing machines, typewriters, and oil, offer examples of self-contained development which have taken place in spite of an absence of international investment. These items belong obviously to the first group of manufactures referred to above inasmuch as the consumers are free agents, spending their own money, and trying to get the most for it. "Big business" influences could not appreciably hold up foreign trade in such lines as these.

The ability of these private corporations to finance foreign sales in an adequate manner emphasizes the handicap under which many would-be exporters are placed, and until this handicap is removed, Canadian export trade will not advance in proper proportion to its ability to do so. In the absence of international financial influence, it devolves upon the industries concerned to persuade their own bankers to do their part in establishing credit machinery.

Trade depends on manufacturing, marketing, and financing or establishing credit. Our manufacturers can produce the goods, our bankers can and ought to produce the credit, and the world can produce the market. We already have the means of filling the first and second of these conditions, but can we as easily secure the last? Do our would-be exporters know what they should export and whether the trade would be remunerative, temporarily or permanently? Are they prepared to build slowly and well, or are they so satiated with easy money, and long contracts secured without genuine selling ability, that the thought of digging up business again is distasteful—or have they looked on their present prosperity in the light of the ten talents, to be used industriously so that in due time they will be doubled.

Trade With British Colonies

Apart from sentimental reasons, the British colonies in the temperate zones appeal most strongly to Canadian commerce largely because of the increasing importance of their agricultural and allied interests, and also because of the relative absence of manufacturing resources.

South Africa occupies a place of increasing importance in the eyes of the exporting world. That its future possibilities are being recognized by competitors is shown by the following statement issued by the Boston Chamber of Commerce in October 1914: "There is a rapidly developing agriculture which is utilizing more and more the resources of fertile soil and favoring climate in the cultivation of crops and the raising of live stock. These will undoubtedly become in time the leading and permanent industries of this vast region, a domain more than double the area of Texas, and lying entirely within the temperate zone. Its chief imports are manufactured products and the natural and convenient source of supply in the emergency is the United States." That it is worth while endeavoring to make Canada a "natural and convenient source of supply" all the time may be gathered from a report by Trade Commissioner Egan from Cape Town, last November. In it he states that the future prospects of all farm implements and machinery are likely to be increasingly large. The country is progressing in agricultural conditions and farmers are using more up-to-date methods. Progress generally is good in spite of conditions of drought. Reference is made to a demand from South African firms for ploughs, implements, and machinery of all kinds, farm-yard and house hand machines, particularly those adapted to motor-power as well. In the year 1911, there were amongst other things the following machines and devices in use on South African farms: 18,619 cream separators, 33,804 churns, 1,331 steam engines, 980 oil engines, 241 gas engines, 211,927 one furrow, 70,259 two-furrow, 7,428 three-furrow, and 178 four-furrow ploughs; 12,597 mowers, 4,659 ordinary reapers, and 3,829 self-binding reapers, etc., etc.

Comparison with American Exports

American manufacturers secured the larger part of this trade. Last year out of a total import in windmills, valued at $340,000, American firms shipped goods to the value of $280,000, while Canada's share was $375. In water-boring machinery, the United States' share of the trade was $81,000, out of a total of $96,000. In pumps the total imports were $600,000, the American share of this trade being $140,000, while Canada exported only $1,800. In other dairy and farm implements and machinery imports, the total value last year was about $1,800,000. Of this amount more than $800,000 was shipped from the United States. Canada's share was $225,000.

These figures show that sufficient trade already exists to justify greater exertion by Canadian firms and those firms who are only now contemplating entering this market will find valuable suggestions offered, and local conditions carefully analyzed and stated in Weekly Bulletin No. 518, page 605, of the Department of Trade and Commerce. The system which has been found most successful in agricultural and dairy lines is resident firms for specified districts. Initial investigation by a factory representative has been a feature of all successful enterprises.

For mining and general machinery of a heavy nature, local representation is an absolute necessity, Johannesburg being the proper location for an agent who should have full power to handle all sales and contracts. When the line will permit of it, a branch house of the manufacturer is best; if this be not possible the manufacturer should come over and select his agents, supplying suitable samples, models, catalogues and advertising material.

Requirements of the Antipodes

The commonwealth of Australia, and the Dominion of New Zealand both resemble, in some respects, our own country here, being more advanced in some directions, while in others Canadian development is ahead. The metal-working industry is an example of the latter, and although the comparatively small proportions attained so far in these colonies may not offer much inducement to many Canadian firms at the present moment, due attention must be paid to the recent commencement of steel making in Australia. The lack of raw material has hitherto retarded the development of hardware and similar manufactures but with extensions in hand to bring the output of steel up to 170,000 tons per annum, the prospects of ultimate business in machine tools, transmission machinery and allied products should appeal strongly especially as most European lines have been cut off during the war.

New Zealand is less likely to develop manufacturing lines to any extent, which might tend to discourage importers, but hydro-electric development under favorable auspices has been inaugurated successfully, and its gradual adoption for power and light will ultimately increase the consumption of certain lines of machine shop products.

Imports of motor vehicles to the value of $2,077,000 for eight months to August 31, 1915, occupy fourth place, but this business is highly specialized by the leading concerns. Various kinds of machinery imported to the following values, indicate the present variety and size of the trade: Dairy, $188,000; agricultural, $260,000; electric, $1,027,000; engines, gas and oil, $390,000; mining, $124,000; sewing, $165,000; railway and tramway plant, $745,000; tools, $349,000; pipes and fittings, $753,000.

Conclusion

A consideration of the various aspects of the question of foreign trade possibilities as affecting the engineering and allied trades of Canada brings one to the conclusion that in certain lines our manufacturers, as such, are capable of competing with those of any other nation, but as exporters they are, speaking generally, disinclined to exert themselves outside of their former spheres of activity. Foreign trade calls for investigation, perseverance, resource, adaptability, patience and organization; profits must be earned by continuous effort, and in many cases, early profits must be sunk in the business for some time to insure a safe and desirable ultimate rate of progress. Adaptability is one of the outstanding features which conduced to the success of Germany in the past, and consists largely in "putting oneself in the other fellow's shoes." By doing so one will avoid much loss in trying to educate a prospective customer away from his own ideas.

Climate, population, geographical location, political and commercial surroundings have much to do in forming national tastes in life, and while machinery and similar manufactured products are perhaps less influenced by these features than are other products, the methods of business involved in their disposal in other countries frequently presents in comparison with our home conditions, a contrast sufficiently great and startling to deter many intending entrants from further effort.

The more the matter is considered, the more promising appear the prospects of a Greater Britain. The British Dominions, with their uniformity of language, in many cases, of climate, and in all cases, of purpose, offer, with their respective diversity of products the greatest opportunity which the world has ever witnessed for the building up and welding together of the four corners of the earth, a consummation in which Canada through the efforts of her industrial and agricultural workers, is destined to play no insignificant part.

COMMERCIAL SIDE OF ENGINEERING

by F. G. Hatch

ENGINEERING, as we know it to-day, could not exist without its commercial side. The young engineer too often thinks that all engineering matters should be regarded as having only technical interest, and that commercial considerations are beneath the notice of the engineer. Well, abstract science is of very little value to the everyday world until it has been commercialised in some form or another.

Of what value to the world at large would Stephenson's invention of the locomotive have been if, after he had made his first engine, it had been described in papers, examined by learned professors, looked upon as an interesting novelty, and—allowed to rust? Its value to mankind became apparent and real when it was seen to open up a new era in transportation, then commercial men advanced the money to build a railway, by means of which it was demonstrated that goods were hauled cheaper and quicker than had previously been possible.

Commercial Aspect Neglected

Is this aspect of their work sufficiently borne in mind by engineers? The writer ventures to think that it is not, especially by younger members of the profession or business, whichever you like to name it. It is an aspect of his future work which is rarely mentioned by his early teachers and masters, and it is seldom mentioned in the classes of college or technical school.

When the young engineer enters a works for his practical training, the one part that he never spends any time in is the commercial offices. His training is supposed to be completed when he has been through the shops and drawing-office, although he may have only the vaguest notions as to how material is bought and the products of the works are marketed and sold. He knows practically nothing of such things as costs, capital charges, profits and loss accounts, and balance sheets.

Is it any wonder, and can it be otherwise, in view of the fact that engineering students receive no regular business training, that engineers, as a whole, are poor business men. The engineer too often fails to realise the fundamental fact that as soon as he leaves the training ground of school and college or workshop and becomes a salary or wage-earner, he has entered the business of engineering and that all his actions and works will eventually be judged by the dollars and cents, standard.

Commercial Value the Final Test

It has been pointed out that engineering work has to pass the final commercial test, and it can be seen that every engineer is also subject to the same scrutiny. As he advances in life and obtains more important positions, he finds that business matters enter more into his work, to the exclusion of much technical work, till finally his next step will depend not so much on his technical as on his business ability.

This is a commercial age, and it is inevitable that anyone failing to combine business ability with technical skill is doomed to limited advancement.

Here it may be well to say that, in speaking of business or commercial methods, out and out commercialism is not intended to be the standard aimed at, but rather a judicious blend of technical skill with a more extensive use of true business principles in everyday work and problems. The engineer may rest well assured that there is no loss of dignity—certainly nothing degrading—in giving due weight and consideration to commercial values.—'From a paper read before the Junior Institution of Engineers.'

NEW TAXATION FOR WAR PURPOSES

THE accompanying statement of the main features of the proposed new taxation for war purposes as disclosed in the recent Budget spent of the Dominion Finance Minister will enable our readers to take hold at a glance of what is involved and who are most directly affected.

A tax of 25 per cent. on the net profits since the beginning of the war, in excess of 7 per cent., of financial, industrial, milling, transportation, public utility and other corporations and munitions firms.

A tax of 25 per cent. on the net profits since the beginning of the war in excess of 10 per cent. of individuals, partnerships and associations with capital of more than $50,000.

No exemption as to capital is made in the case of munition manufacturers.

Under pro rata arrangement tax will apply to companies not incorporated in Canada, but doing business in Canada.

Capital defined as amount paid up on capital stock.

If capital of any company is increased, or additional stock issued after February 15, 1916, Minister of Finance will have power to decide whether it is fair and proper to include such increase when determining capital of the company.

No deductions from gross profits for depreciation, renewals, etc., allowed except such amounts as appear reasonable to Minister of Finance.

Deductions from gross profits for salaries of directors, managers, etc., must not exceed, except in special circumstances, the sums deducted in last accounting period prior to August 4, 1914.

Life insurance companies, while not subject to tax, will be expected to keep a certain proportion of their assets in Dominion Government securities.

In case of banks, amount being paid under previous war tax will be credited when charging new tax.

Tax will be payable November, 1916.

Expected to realize revenue of $25,000,000 to $30,000,000.

An increase from 40 to 90 cents per barrel in the general tariff on apples.

A duty of ½c per gallon on petroleum fuel oil.

Compulsory investment by insurance companies in Government securities.

PRODUCTION METHODS AND DEVICES

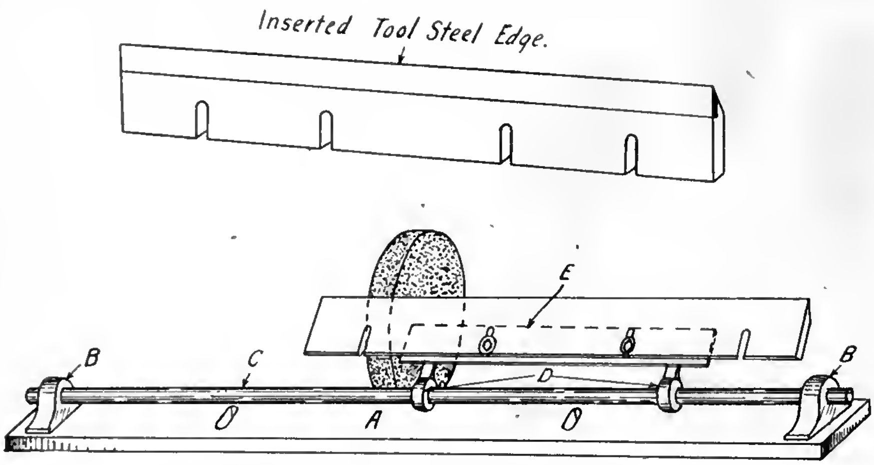
A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

GRINDING LARGE PAPER KNIVES

By H. C. F.

MECHANICS who are connected in any way with the printing or paper trades, realize the necessity of keeping the paper cutting knives in perfect condition. It is essential that the edge be kept extremely keen in order to insure that the work for which they are intended will be accomplished with the least effort, while at the same time procuring a clean even cut.

The knives are similar in design to that shown by the sketch, Fig. 1. The body of the knife is made of a good quality soft steel, with an inserted tool, steel-cutting edge, as shown. The knives vary in size, according to the class of work for which they are intended. An average length, however, would be about 50 inches; the width and thickness averaging about 5 in. and 5/8 in. respectively. The width of the bevel is approximately $1\frac{1}{8}$ inches, this being practically standard, since it has been found to give the most satisfactory results.



FIGS. 1 AND 2. PAPER KNIFE GRINDING.

In grinding the knives, a certain degree of skill is necessary, and at the same time considerable care must be taken, especially when an emery or carborundum wheel is used. There is always the danger of overheating the knife, causing the edge to lose its temper. Should this occur, the natural result is that the usefulness of the knife is somewhat seriously impaired.

Special grinding machines have been designed for this particular class of work and no doubt they accomplished their purpose satisfactorily. A small machine shop, however, would not be repaid for installing such a machine, especially when a jig, which will give just as good results, can be constructed with practically very little outlay.

This jig, as shown in Fig. 2, is secured to the front of an ordinary grinding machine. The base A is made of cast iron, or more preferably of wrought iron bar stock, about 6 feet long by 5 inches wide. To either end of the base are bolted the blocks B, which act as supports for the shaft C. The latter should be of generous diameter—about $1\frac{1}{2}$ inches—so as to prevent any sagging when the weight of the knife is thrust upon it. The two collars D are made a sliding fit for the shaft, and to them is fastened the plate E as shown. The knife is bolted to this plate, and is so adjusted as to enable the stone to cut the desired bevel. In adjusting the knife, care must be taken to have both ends of exactly the same height, otherwise one end of the knife would be brought to an edge much quicker than the other.

The wheel used should be of a fine grain carborundum, about 12 inches in diameter, and 2 in. or $2\frac{1}{2}$ in. face. A wet stone might preferably be used, since it, to a certain extent, eliminates the danger of taking the temper from the knife edge. In operation, the knife is simply moved backward and forward across the face of the stone, until the edge is brought up to the desired keenness. After being ground, the knife is hand-whetted, in order to remove any burr which might be found during the grinding operation.

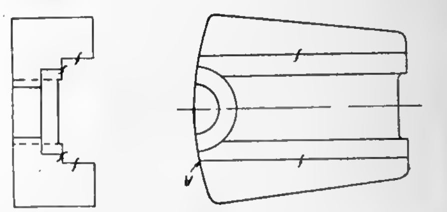
It might be interesting to note here the manner of grinding paper knives as adopted by a small shop which "exists" on grinding only. The old grinder man—he has been grinding for over forty years — states that "paper-cutting knives should neither be ground by special machinery nor emery wheels." Perhaps he is right, for the fact remains that he has built up one of the largest knife grinding shops in one of our leading cities.

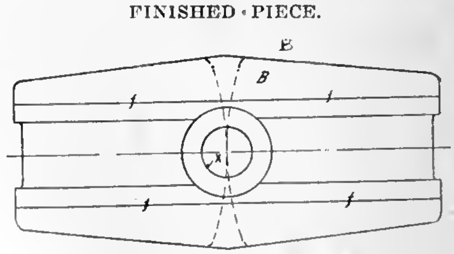
His methods are simple—in fact, crude. The stone used is a soft sandstone, about 5 feet in diameter, with a 10-inch face, and running about 200 revolutions per minute. A long, rough-planed board is fastened to the front of the wheel-stand, and in this a few spikes are driven to act as a guide for the knife. The latter is merely held against the stone by hand pressure, being at the same time moved across the face. By this method, it requires about one hour to grind an average size knife; and since the stone is running in water and at a slow speed, the danger of over-heating the knife edge is entirely obviated.

COMBINING PARTS FOR PRODUCTIVE MANUFACTURE.—II.

By F. Scriber.

AN interesting example of the combination of two pieces for convenience in drilling is shown by Fig. 9, where A is the finished product and B the work in combination. After milling the various portions, as indicated by the finish marks, the hole X is bored, thus leaving the two parts as shown in the illustration. These are sawn apart, and placing a number of them in the fixture, Fig. 10, on a boring mill, the radius


FINISHED PIECE.



WORK AFTER DRILLING.

FIG. 9. COMBINATION OF MILLING AND DRILLING OPERATIONS.

Y is turned in the usual manner. In this fixture the parts are located radially by means of the seat A, and are set against the pins B by means of the screws C to

obtain the correct radius relative to the bored holes. The parts are clamped in pairs by means of the clamps D.

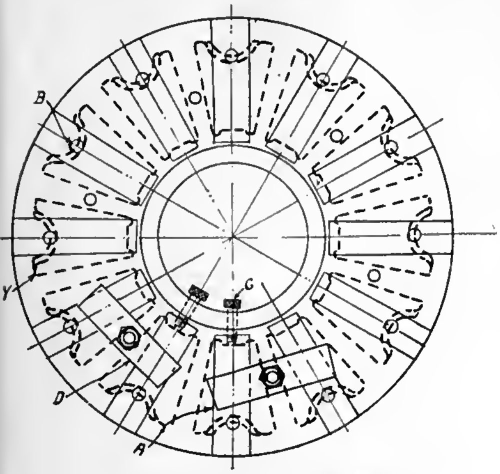


FIG. 10. METHOD OF TURNING RADIUS ON PART SHOWN IN FIG. 9.

As a commercial proposition, the possibilities of accurate cutting off are quite often overlooked, and on work not suited to the screw machine the usual practice is to cut off the work before starting to machine it; but it is often possible to work to better advantage by leaving this operation until after turning. In this manner a long bar may be centered and turned in a lathe by using a follow rest in the manner shown by Fig. 11, following which the bar or a number of bars may be cut off within two or three-thousandths on a modern cutting-off machine. To do this, the bars are rested in accurate vee blocks and cut into short lengths with a circular saw.

In Fig. 12 a drill jig, suitable for finishing collars, made from the bar in the foregoing manner, is shown, which consists of a holder for the work X, which is located from the outer diameter, a clamping screw A to keep the work in place, and the two guide bushings B for drilling in the usual manner.

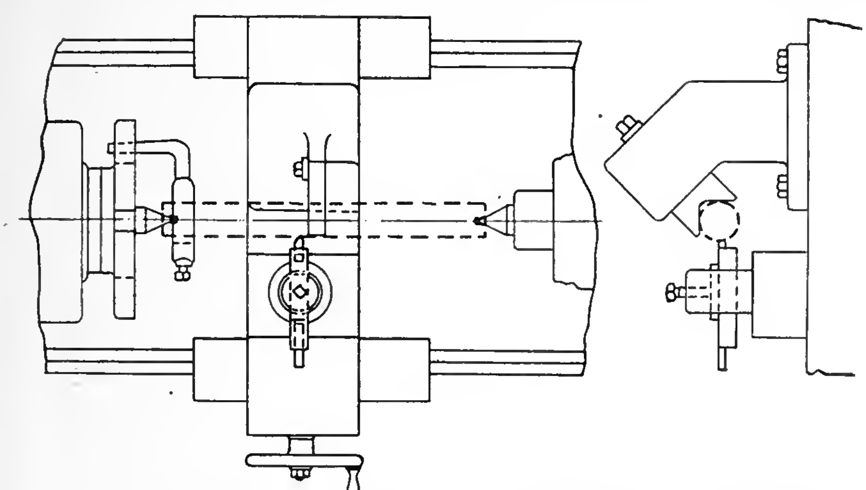


FIG. 11. TURNING A LONG BAR IN LATHE USING FOLLOW REST.

Introducing Turning

When a large number of parts, such as are shown at A, Fig. 13, are to be machined all over, they may be handled as a combination and made up in ring form, as shown at B, Fig. 13. To accomplish this, the forged steel ring from which the parts are cut is placed on a boring mill while the hole is bored and one side is faced, holding the work by the outside in chuck jaws. Following this, the unfinished side is finished by gripping the work with soft jaws from the inside in the manner shown from the illustration, Fig. 14. The next illustration, Fig. 15, shows the manner of drilling the holes, this being accomplished on a multiple spindle drill, all holes being put in the ring at one time. The next operation is to cut the rings into the required sections, using an indexing fixture, Fig. 16, for this purpose. In operation this fixture is placed on a horizontal milling machine with a saw on the arbor. The ring A is located by the hole on the plate B with pin C in one drilled hole for radial location, while each portion of the ring to be cut apart, except the first, is clamped by straps D tightened by nuts E. After setting this fixture in place, the work is securely clamped, and the first cut taken; the fixture is now indexed and the second cut taken and the portion between cuts is taken out. By successive indexing, as each two pieces are cut, a clamp may be removed, thus when the last part is cut but one clamp must be loosened. This method practically permits the use of all the time for cutting.

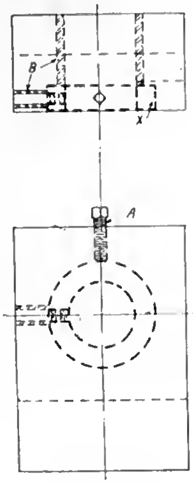


FIG. 12.

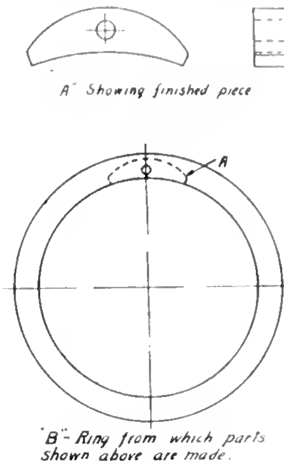


FIG. 13.

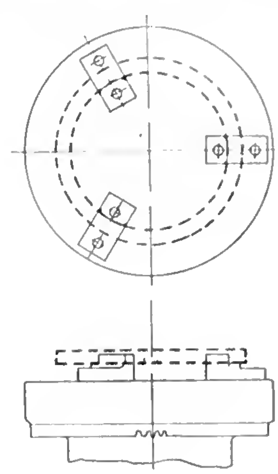


FIG. 14.

The last operation leaves the work as shown at A, Fig. 17, and the final operation consists of milling the form opposite the radius. This is accomplished by the use of special vise jaws and a pair of formed milling cutters. To perform this operation the work is set up on a horizontal milling machine in a vise, as in Fig. 17. The work is located by the radius X on a formed jaw B, centralized by the pin C. In this position it is evident the form can be cut in two operations, roughing close to form and finishing with cutters D. The operations on this piece simply enumerated are: forge ring, bore and face ring, drill holes, cut apart, and mill form.

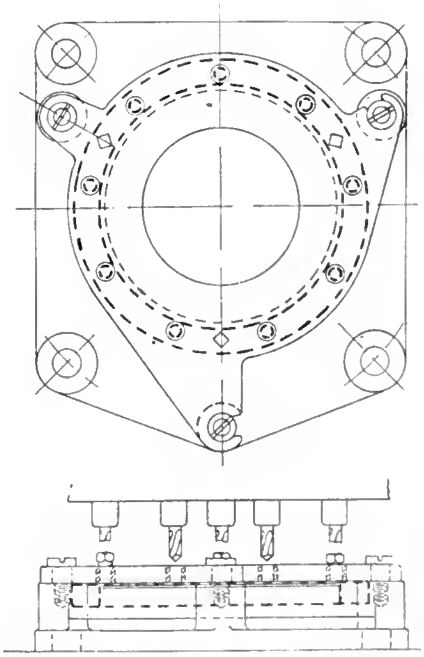


FIG. 15. DRILLING HOLES IN RING, FIG. 13, WITH MULTIPLE SPINDLE DRILL.

The examples here described are such as are readily accomplished by combining the parts throughout most of the operations and, needless to say, the limit

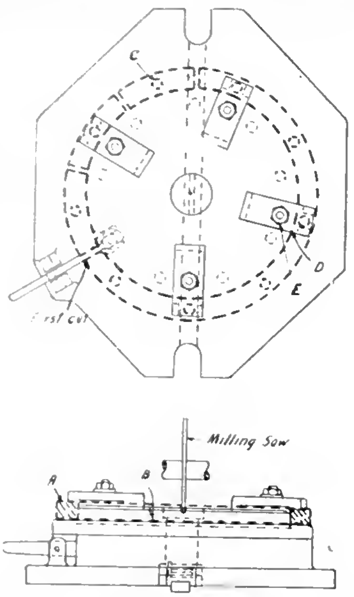


FIG. 16. METHOD OF CUTTING RING APART.

to the possibilities of this system can only be determined by careful selection of the every-day problems which modern production presents. Often where an

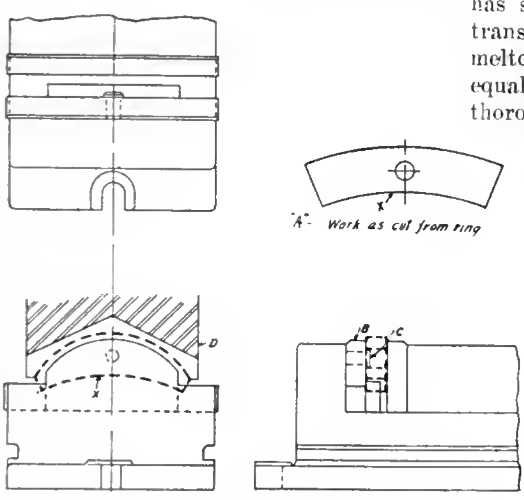


FIG. 17. FINAL OPERATION ON PART SHOWN IN FIG. 13.

expensive special tool may be required to finish a part in its desired form two or more parts together can be readily handled at less expense.

FLOATING AXLES

THERE appears to be much diversity of opinion as to the meaning of the term "floating," "semi-floating" and "non-floating," as applied to live axles. These terms, says G. W. Watson in a paper on "Live Axles" read before the Insititution of Automobile Engineers, are much used in impressive tones by many salesmen and others who have obviously no conception of their meaning; they often couple them with varying arrangements of spring mounting, torque and thrust rods, etc., in a most perplexing manner.

The interpretations proposed by Mr. Watson are:—Floating axle: An axle in which the wheel-driving or differential shafts transmit only torsional effort.

Semi-floating axle:—An axle in which the wheel-driving shafts partly or wholly support the bending stresses due to the gear drive plus the torsional stresses, but which are relieved of all bending stresses due to the imposed load and the tractive resistance.

Non-floating axle:—An axle in which the differential shafts wholly or partly take the combined bending stresses due to the imposed load and the tractive resistance, plus the torsional stresses due to the transmission of power to the wheels.

SEALING-UP HOLES IN TRANSFORMERS

IT is often necessary to seal up holes in transformer or oil-switch cases where wires pass through. Probably the most commonly used material for this purpose is a mixture of sulphur and plaster of Paris. Either material used by itself may answer the purpose in some cases, but if the two are mixed half and half it gives a very hard substance when it has set, and one that is impervious to transformer oil. The sulphur should be melted in a ladle or pot and then an equal quantity of plaster of Paris mixed thoroughly into it. This mixture should be poured into place while hot.

Trouble is often experienced from oil being syphoned out of transformer cases on account of the braided insulation on the lead wires. When this takes place it is usually found that the insulation on the wire dips down into the oil. If the oil level is lowered below the terminal board inside the case and the insulation on the leads scraped off so that where the wire enters the surface of the oil its metallic surface only is exposed to possible contact with the oil and the leads are properly sealed, there will be little trouble due to syphon action.

COST OF LIVE FLOWING STEAM

By W. F. S.

TOO few engineers appreciate the value and usefulness of Napier's formula. It is used, generally, wherever steam is allowed to flow directly from high boiler pressure into the atmosphere, as in furnaces for creating draft, in soot blowers, in whistles, etc. The formula is

$$W = \frac{p\,a}{70}, \text{ where}$$

w = the weight of steam in pounds flowing through the area (a) per second.

p = steam pressure in lb. per sq. in.

a = area of orifice in sq. inches.

To make this formula a little more applicable to most engineering conditions, I have converted it into this form:

Cost of steam in dollars per 10-hour

$$\text{day} = \frac{9}{35}\,\frac{p\,a\,c}{s}, \text{ where the additional let-}$$

ters represent the following:—

c = cost of coal in dollars per ton of 2,000 pounds.

s = pounds of water evaporated into steam in the boiler or boilers per pound of coal.

For example, what is the cost of the steam per day flowing through a ½ inch nozzle for creating draft in a furnace wehere,

p = 140 pounds per sq. in.

$$a = \left(\frac{1}{2}\right)^2 \frac{P}{4} = 196 \text{ sq. in.}$$

c = $4 per ton.

s = 8.5.

Substituting in the formula, we get,

$$\frac{9 \times 140 \times .196 \times 4.}{35 \times 8.5} = \$3.32 \text{ per 10-}$$

hour day.

ARMATURE KEY TROUBLE

A 100-KILOWATT direct-connected exciter set soon after erection developed a slight knock which the operators were unable to stop. It ran about four years with the sound gradually getting worse, and the operators were sure that the trouble was in the armature, which was keyed solidly on the shaft, but which gradually seemed to be getting out of balance. Finally the risers from the commutator to the armature coils began to break. The commutator was then removed from the shaft, and the trouble found out. The armature was fitted with the usual cast iron spider with all the laminations keyed to it with one key. The laminations were too large for the spider and had been improperly keyed on, allowing them to work backwards and forwards on the key, thus causing the knock and finally crystallizing the risers. A new key was fitted, and the set is running quietly.

The Chalmers Motor Co. was incorporated under the laws of Canada recently with a capital of $1,000,000, as the first step toward a Canadian branch. C. A. Pfeffer is vice-president and assistant general manager of the company. Mr. Pfeffer has stated that motor car manufacturers in the Dominion can now obtain practically everything that goes into the construction of motor cars in this country.

Lathe and Screw Machine Automatic Mechanical Control *

By L. D. Burlingame

The growing tendency towards the adoption of automatically controlled machines arises from the fact that uniformity and quantity of product easily surpass that obtainable by hand-operated mechanisms in the sphere of commercial manufacture. The introduction to the paper points out the more important considerations entering into the question of installing automatically controlled equipment, following which a classification of the prominent and essential features relative to the latter is given accompanied by typical illustrations.

IN a general way the term "automatic control" applies to the organization of a machine so that all operations required to complete the work are automatically performed, and the object is to have these operations so performed as not only to secure in large measure the advantages of hand work guided by human intelligence, but also to insure a uniformity and quantity of product beyond that which can be commercially obtained by hand work.

In determining whether the employment of automatically controlled machines is warranted, the vital question is whether the product is wanted in sufficiently large quantities and whether the design is sufficiently well established to justify the investment in such special machines.

It must be determined whether the added original cost and greater cost for repairs are justified when to this must also be added the more expensive tool equipment and longer time required for setting up. In considering the cost for repairs, the conditions to be borne in mind are the greater danger of a breakdown and the greater skill required to keep the machine in running condition.

The fact that, in operating automatically controlled machines, the human factor is less in evidence than is the case in hand operated machines, makes it possible generally to employ less skilful workmen without lowering the quality of the work. On the other hand, the use of automatically controlled machines increases the need of skilful supervision and of skilled men for their construction and repair.

The features most prominent and essential in the automatic control of machine tools can be classified as follows:—Spindle drives; means for inserting and removing the work; feeding mechanisms; indexing mechanisms; controlling means for the various mechanisms.

Spindle Drives

Features of automatically controlled spindle drives may be classified as speed change, reversal, stopping.

Speed Change.—In automatic turret machine work it is often important to have more than one spindle speed available during the operation on a given piece of work, in order that time may be most fully economized.

The automatic change of spindle speeds on machines having a constant speed motor drive is usually provided for by gearing controlled by the mechanism of the machine. Fig. 1 shows the front view of an automatic turret lathe embodying this feature. In this construction any one of eight changes of spindle speed can be automatically obtained, the changes being made by means of an intermittently revolving drum carrying dogs which shift levers 1, 2 and 3 as desired. Levers 1 and 3 control clutches to engage gears giving four speeds, and the number of speeds so obtained can be doubled by the operation of lever 2 which either clutches direct to the spindle for the fast range of speeds or connects through differential gearing for a slower range of speeds. The dogs on the drum may be so set as to bring the levers into idle positions, thus disconnecting the gearing.

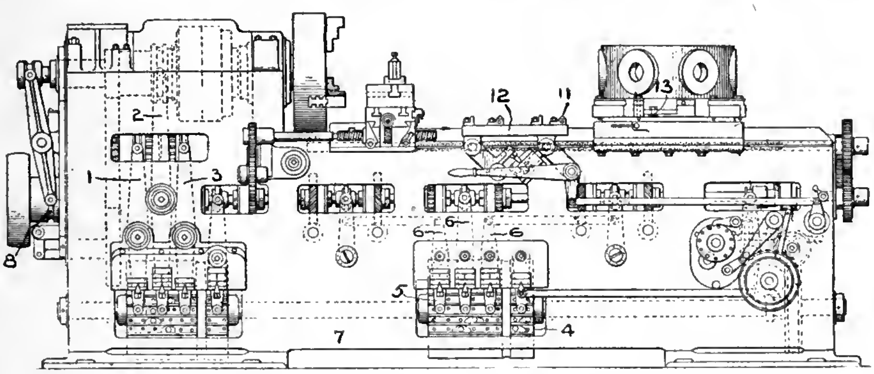


FIG. 1. AUTOMATIC LATHE WITH VARIABLE SPEEDS AND FEEDS CONTROLLED BY DOGS ON DRUMS—GISHOLT MACHINE CO.

In types of machines such as cutting-off machines or those on which squaring-up operations are largely performed, a gradual and continuous change of spindle speed is desired. A means for automatically accomplishing this is shown in Fig. 2. The automatic shifting of the belt on the tapering cones gives the desired change of spindle speed. Cam 1 is connected by gearing to the tool carriage of the machine and controls the traverse of the belt shifter 2, so that by providing the required accelerating lead to the cam, a constant cutting speed is obtained.

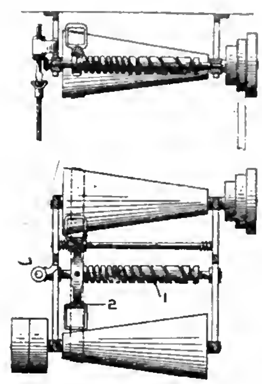


FIG. 2. COUNTERSHAFT FOR CUTTING-OFF MACHINE TO GIVE CONSTANT CUTTING SPEED.

Reversal of Spindle.—In designs of machines where the threading or other operations require a reversal of the spindle, this is automatically accomplished in various ways, an example being shown in Fig. 3. From the constant

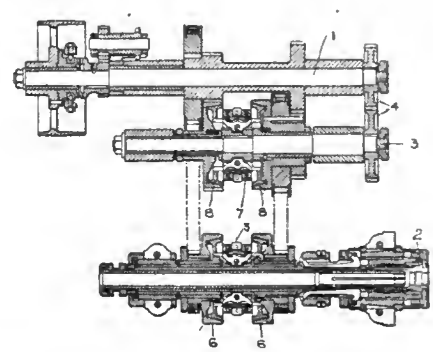


FIG. 3. CONSTANT SPEED DRIVE FOR SCREW MACHINE PROVIDED WITH AUTOMATIC REVERSE AND SPEED CHANGE. BROWN & SHARPE MFG. CO.

*Presented at the annual meeting of the American Society of Mechanical Engineers, December, 1915.

speed shaft 1, the spindle 2 is driven in either direction and at various speeds, the control being automatic for direction and for one change of speed. Other changes of speed are by means of change gears 4. The reverse is obtained by shifting thimble 5, engaging respectively friction clutches 6 connected by chain and sprocket with the oppositely revolving shafts 1 and 3. The shifting of the thimble is by means of a lever operated by a cam on an intermittently revolving shaft. The intermittently revolving shaft is in turn set in motion by a trip lever operated by dogs on a continuously revolving disk. The automatic change of spindle speed is by means of thimble 7 engaging respectively clutches 8, also operated by lever connection to a cam on an intermittently revolving shaft.

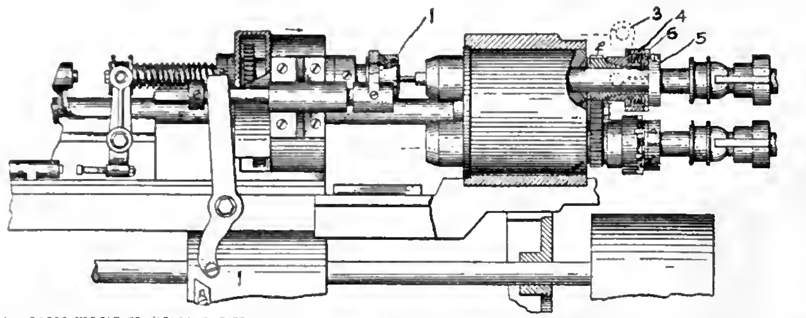


FIG. 4. MULTIPLE SPINDLE SCREW MACHINE WITH MEANS FOR AUTOMATICALLY STOPPING THE SPINDLE. NATIONAL ACME MFG. CO.

Automatic stopping of the spindle is required for various kinds of work. Some screw machines are so designed as to unthread the die or tap by stopping the work spindle to run the die or tap off after the threading operation. Sometimes the spindle is stopped to perform a milling, cross drilling or similar operation, and sometimes to save time in removing and replacing work when this is a hand operation.

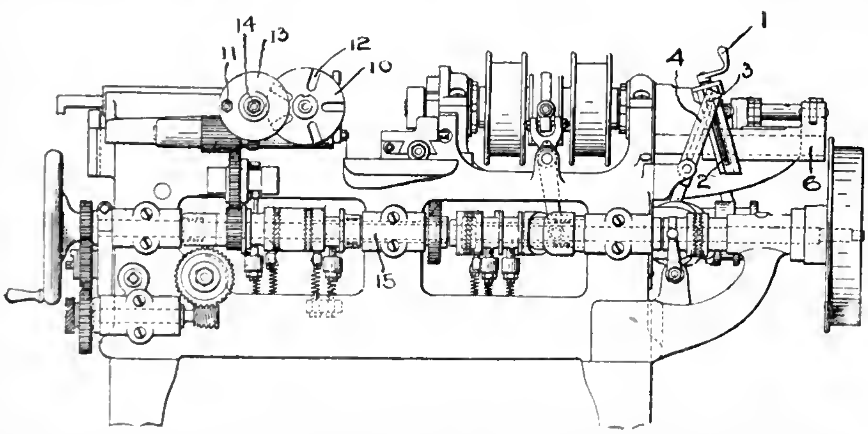


FIG. 5. AUTOMATIC SCREW MACHINE SHOWING FEEDING AND INDEXING DEVICES, ALSO USE OF CONTROLLING SHAFT, BROWN & SHARPE MFG. CO.

An automatic screw machine having the feature of stopping the spindle for the purpose of threading is illustrated in Fig. 4. The revolving tap or die spindle is shown at 1, and when each successive work spindle is brought in line with it, a clutch on the constantly revolving gear 2 is disengaged by the lever 3 operated by a cam through a series of levers. This lever 3 engages a sleeve 4, which is normally in spring pressed engagement with gear 2, disengaging same from gear 2, and engaging it with collar 5, which is fast to the spindle and which constitutes a brake to stop the spindle from revolving.

Inserting and Removing the Work

Means for Feeding and Holding Bar Stock.—Bar feeding devices have in a general way followed the lines of the hand operator Parkhurst feed, brought out in the shops of the Pratt & Whitney Co., about 1871. The use of feeding fingers and roller feeds, in the latter case necessarily feeding against a positive stop, are forms of development which have since followed. In the former case graduated levers or scales determine the distance the stock is fed.

An illustration is shown in Fig. 5 of an automatic feeding device which can be adjusted so as to feed any required distance from zero to the full traverse of the machine. By means of the crank 1, the screw 2 adjusts a nut carrying a block 3, so that the motion of the lever 4 operated by a cam may give any desired feed to the slide 6, and thus to the feed tube, the setting being to a graduated scale. At the forward end of this feeding tube are feeding fingers to engage the bar of stock to feed it forward.

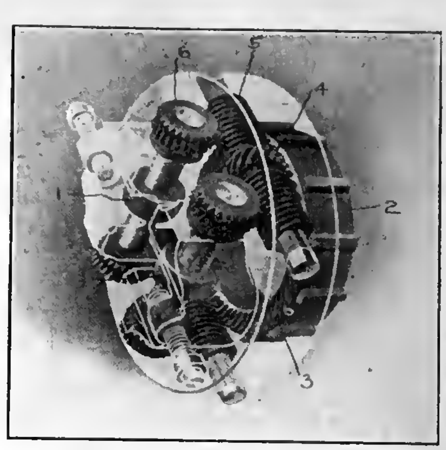


FIG. 6. ROLLER FEED. JONES & LAMSON CO.

After the stock is gripped by the chuck by means of chuck levers operated by a cam, the feeding fingers are retracted ready for the next operation. By means of a special device, the machine can be stopped when the bar of stock becomes exhausted.

A well-known design of the roller principle for feeding the stock is shown in Fig. 6, where the rollers 1 engage the bar of stock and feed it forward against a stop. The driving means for the rollers consists of the circular rack 3, on the intermittently revolving ring 2, which, when held stationary, revolves the gear 4, which in turn revolves the worms 5, and the worm wheels 6, the latter being fast on the shafts carrying the feed rollers.

Inserting and Removing Chucked Work

This may be considered through successive stages from the hand-operated method of the Fay automatic lathe, where the work, when it is to be finished on an arbor, is driven on one arbor by the workman so as to be ready to replace the piece being operated on when that is finished, the automatic feature in this

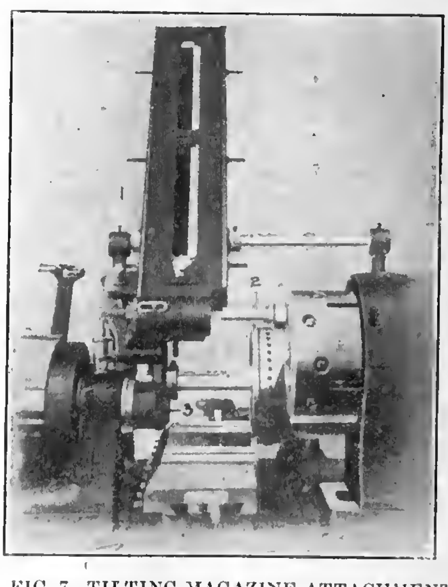


FIG. 7. TILTING MAGAZINE ATTACHMENT —CLEVELAND AUTOMATIC MACHINE CO

case being the stopping of the spindle, as already described.

Magazines for handling work to be chucked automatically have developed along many lines. Fig. 7 shows a tilting magazine attachment with the magazine 1 in position, so that the conveyor 2 can advance to take a piece of work. After the piece of work is taken by the conveyor, the magazine tilts up out of the way of the turret tools. The conveyor 2 then brings the piece in line with chuck 3 and deposits it in same. The conveyor is free to revolve so as to facilitate the pressing of the work into the revolving chuck. An ejector inside the spindle removes the work when completed.

A form of hopper for feeding studs into the rear end of the spindle is shown in Fig. 8. This might be called a reservoir magazine, as it has a widened upper portion to carry a large number of pieces. An agitator 1, operated by a lever 2, makes the feeding sure. The frame 3 is adjustable for different lengths of studs. The studs are fed positively into the back end of the spindle by the rod 4.

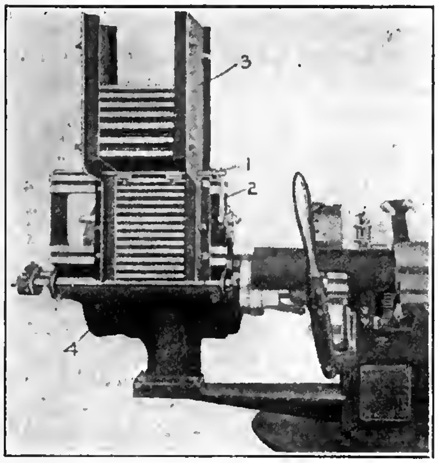


FIG. 8. VERTICAL HOPPER MAGAZINE—CLEVELAND AUTOMATIC MACHINE CO.

Large or irregular work presents many difficulties in automatic chucking, and hand methods are usually resorted to for such work. In some cases, however, automatic means have been devised for the chucking operation.

Even when placing the work in the chuck by hand, automatic devices can be made to assist in many ways. Fluid or pneumatic means can be employed for gripping the work, and this can be so applied as to reduce the pressure for the finishing cut, still maintaining sufficient to hold the work securely, but without risk of distortion. Means for automatically ejecting the work can also be applied.

Transferring Work for Secondary Operations

It is a common practice to transfer work from the main spindle to an auxiliary spindle or holder, after part of the operations have been performed, for additional operations such as milling, cross drilling, etc.

Fig. 9 shows a transfer holder in use for slotting the heads of screws. The transfer arm 1 is swung by the rock shaft 2 so that the hole 3 is in line with the work 4 in the main spindle and engages same before the work is severed from the rod. After the work is severed, the arm 1 is swung to the position shown in the illustration. The rock shaft 2 is then fed longitudinally toward the saw 5, both this motion and the rocking motion being imparted by cam action.

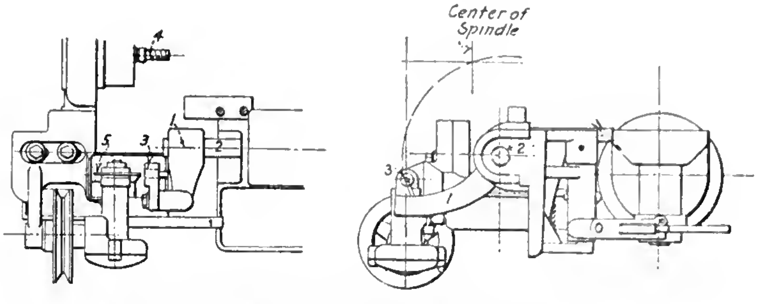


FIG. 9. TRANSFER ARM FOR SECONDARY OPERATIONS, BROWN & SHARPE MFG. CO.

The transfer holder can be made to turn the work end for end if desired.

Feeding Mechanisms

Feeding mechanisms may be classified by the methods of controlling the movements by removable strap cams; by permanent cams, and adjustable cams and dogs; by adjustable dogs on drums; by cams specially formed for each job, and by permanently set dogs in combination with adjustable stops. The object to be attained by all these means is to save time by speeding up during the idle movements, and to provide the most efficient feed for each operation of cutting by providing a change of feed which can automatically be made effective during the operation of cutting.

Control by Removable Strap Cams.—This type had its origin in the Spencer machines, first brought out in the early 70's. A recent development of this type of machine and one also designed by Mr. Spencer is shown in Fig. 10. In this machine the stock feeding mechanism, the tool feeding mechanism and the cross feeding mechanism are all operated by adjustable strap cams. In the case of the two former, the straps are on the periphery of drums shown at 1 for the stock feed and at 2 for the tool feeding machanism; in the case of the last, as well as for indexing and locking the turret, they are on the faces of discs (shown at 3 for the cross slide and at 4 for the indexing).

The machines of the Hartford Automatic Screw Machine Co. in the United States, and of the Alfred Herbert Co., England, are among the best known examples of the use of this method of camming.

Control by Permanent Cams and Adjustable Cams and Dogs.—An example of the combined use of permanent cams with adjustable cams and dogs is shown in Fig. 11, where the feed of the individual tool holders 1 is controlled by the

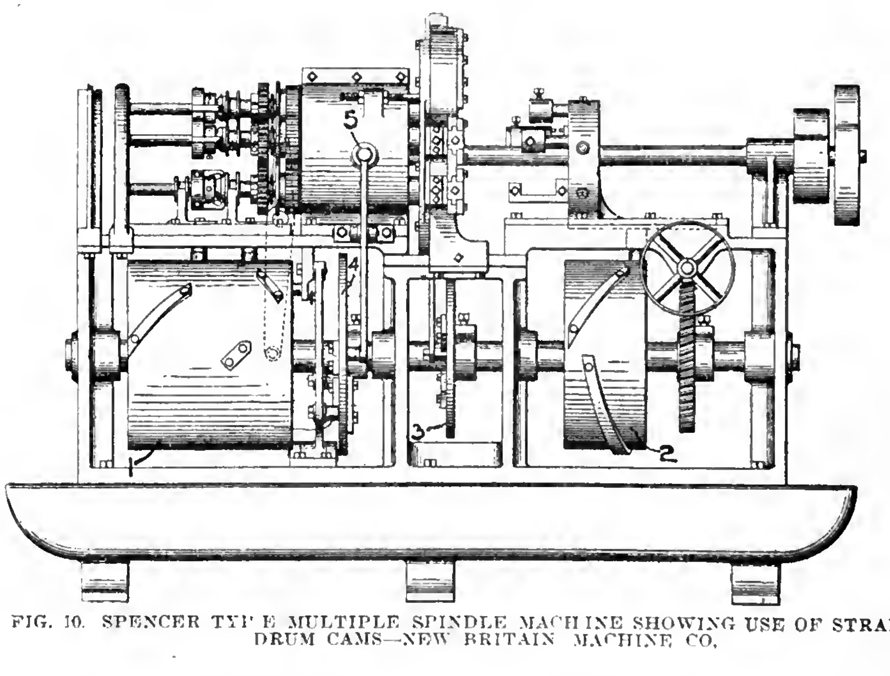


FIG. 10. SPENCER TYPE MULTIPLE SPINDLE MACHINE SHOWING USE OF STRAP DRUM CAMS—NEW BRITAIN MACHINE CO.

permanent cam 2. The rate of revolution of this cam 2 is controlled for varying the feeding movements by an adjustable cam 3 which through roll 4 governs the position of friction wheels 5 between the discs 6. Besides this variable feeding movement, a quick movement of the cam 2 is obtained by action of the cam 7 which operates a double clutch 8 to connect either direct, giving a quick movement, or through the reduction gears 9 for the feeding movement.

The strap cam 10 regulates the cross feed, and this cam also partakes of the quick and slow movements controlled by clutch 8; it thus provides for moving the cross slide forward quickly to the point of cutting and then reducing to the required cutting feed, after which it may be quickly returned so as to bring the rear tool into cutting position following which the feeding movement is again engaged.

Control by adjustable dogs on drums.—The machine shown in Fig. 1 has its movements controlled entirely by dogs on intermittently revolving drums, the only exception being the back facing device which is controlled by a permanent cam 8. For the turret, the feeding is controlled by means of dogs 11 on the hinged carriage 12 engaging adjustable tripping blocks 13 on the turret, providing an independent tripping point for each tool of the turret.

Control by cams specially formed for each job.—The advantages aimed at by this method are the securing of the ideal conditions as to rate of feed, etc., for each operation, and the minimum time for idle movements, and being able to duplicate readily these results for the same job at any future time, the cams being marked and preserved for this purpose.

The cam operated turret feed mechanism of such a machine is shown in Fig. 12. The advance feed is obtained by the cam 1 operating through the segment lever 2 to feed the turret slide 3. The return motion is accelerated by the revolution of the crank 4 bringing the turret back quickly an amount equal to the throw of the crank. The cross feed slides, which are independent of each other, are also operated by special cams adapted to each particular job.

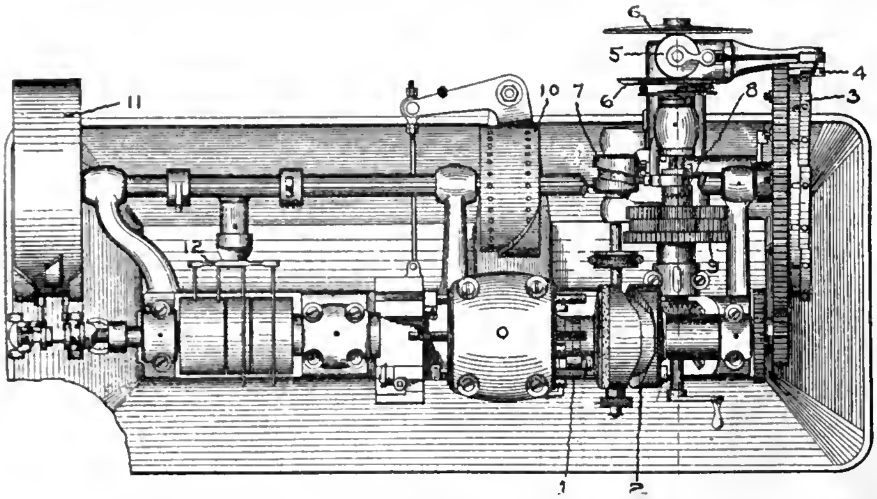


FIG. 11. SHOWING CONTROL BY PERMANENT CAMS AND ADJUSTABLE CAMS AND DOGS. CLEVELAND AUTOMATIC MACHINE CO.

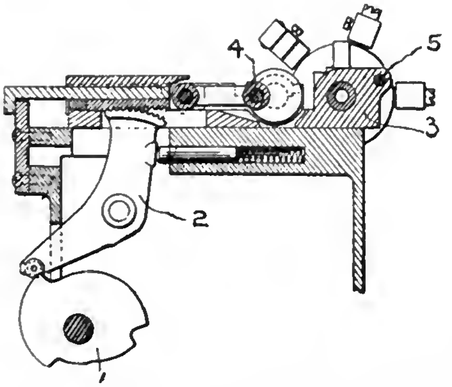


FIG. 12. FEEDING OF TURRET SLIDE BY CAM SPECIALLY FORMED FOR THE JOB. ADDITIONAL QUICK RETURN DEVICE. BROWN & SHARPE MFG. CO.

In a machine for high speed work it becomes important, both in securing the desired speed and in avoiding objectionable shock, to move and reverse the lightest possible parts. For this reason, machines having turrets of the "revolver" or "barrel" type, in which each spindle can be fed independently, are specially adapted to high speed work. In such machines each tool carrier is connected successively with a reciprocating feed slide, and only the feed slide with one of the tool carriers connected therewith requires to be reciprocated for the feed and return movements. Fig. 11 shows a machine of this type. In order to "speed up" still further this type of machine, the use of an auxiliary slide has been resorted to. this auxiliary slide alone being moved during that part of the quick return movements required to retract each tool and even this being disconnected for the remainder of the return movement, thus avoiding the shock which would result from the rapid movement of these slides.

Control by Permanently set dogs in combination with adjustable stops.—This is a feature of the Bullard Mult-au-Matic vertical lathe, Fig. 13. In this machine the workman inserts and removes the work at one station or indexed position of the machine, while tools in the remaining positions are performing successive operations on other pieces. The rods 1 and 2 carry dogs which engage stops on the frame of the machine and trip respectively the advance and return feed movements. The quick traverse motion, which, in addition to retracting the tools quickly, can also bring them quickly forward to the point of cutting, is operated through gears 3 and 4 controlled by clutches. The advance feed for cutting is through bevel gears 5 and change gears connecting shafts 6 and 7, the worm 8 on the shaft 7 driving worm-wheel 9. These two trains of mechanism

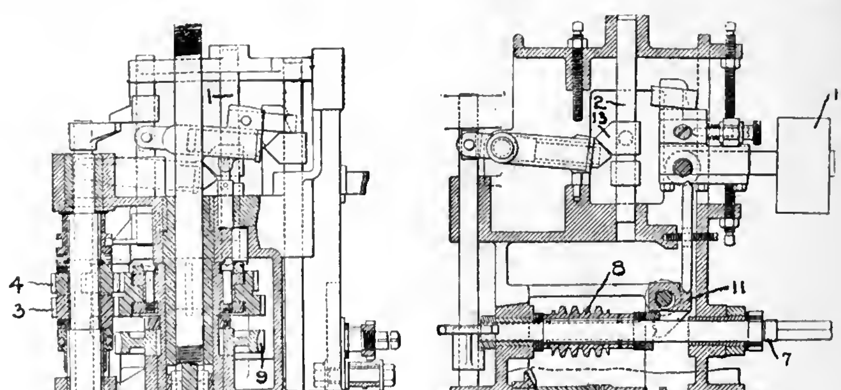


FIG. 13. TOOL DEVICES HAVING THE FEATURE OF TRIPPING THE FEED IF PRESSURE ON TOOL BECOMES EXCESSIVE. BULLARD MACHINE TOOL CO.

give the desired advancing and retracting movements through connection with screw 10.

Indexing Mechanisms

Under indexing mechanisms are here treated: (a) Method of revolving turret; (b) Method of locking and clamping turret, and (c) Rectifying the indexing.

Method of Revolving Turret.—A well-known method of indexing automatic turret machines is by the use of the principle of the Geneva stop. This has the advantage of giving a slow starting movement gradually, accelerating and slowing down before reaching the stopping point, thus securing rapid indexing and at the same time avoiding shock. An illustration is shown in Fig. 5 where the turret 10 is indexed by the engagement of a pin 11 in the slots 12, the disk 13 carrying the pin being intermitently revolved on the shaft 14.

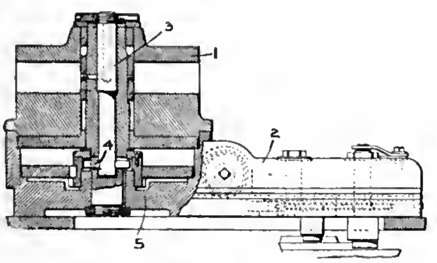


FIG. 14. CLAMPING DEVICE FOR TURRET. POTTER & JOHNSTON MACHINE CO.

Methods of Locking and Clamping the turret.—It has been the general practice in turret machines to have a locking pin to automatically engage to insure the accurate alignment of the turret with the spindle and to hold the turret firmly in position while the tools are operating. Such locking pins are shown at 5, Fig. 10, and at 5, Fig. 12. In addition to the use of a locking pin, a further clamping device is often used which automatically clamps the revolving turret securely to the slide or bed and unclamps it before the next indexing.

An example is shown in Fig. 14, where the turret 1 is clamped to the turret slide 2 by the central stud 3 which is forced downward by a camming action on the projecting lugs 4. This camming action is produced by the revolving of gear 5, this gear in turn being acted on by a rack controlled by dogs acting at the desired point of the return motion of the turret slide. The locking pin for the turret is also operated from this same rack, and thus is timed with the clamping device.

Means for rectifying the indexing.—In multiple spindle machines it is more difficult to secure accurate indexing and thus produce accurate work than in single spindle machines, because of the mechanical difficulties of constructing the machine. It is difficult to bore the spindle carrying head and mount the spindles in it so that they will be equally spaced and equidistant from the centre. To overcome such inaccuracies as are due to this cause, rectifying stops have been employed as shown in Fig. 15, one for

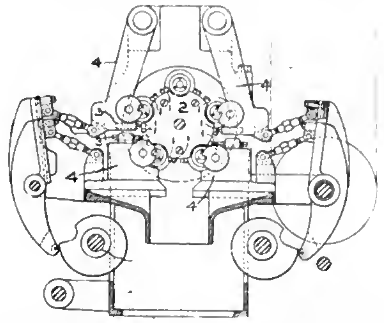


FIG. 15. MEANS FOR RECTIFYING THE INDEXING OF MULTIPLE SPINDLE MACHINE. DAVENPORT MACHINE CO.

each cross tool carrier. These consist of a series of pins 1 projecting from the disk 2, which disk is secured to the front end of the spindle head. These pins are engaged by co-operating stops 3 on the tool carriers 4, and are made so that the cutting edges of the tools carried by the tool carriers 4 will be exactly the same distance from the centre of each spindle when the pins and their co-operating stops are engaged, thus tending to counteract the inaccuracy above referred to, or any which may result from wear in the machine.

Controlling Means for the Various Mechanisms

Aside from the ordinary practice in directly controlling the various movements of an automatic turret machine, Mr. Flanders in his paper before the International Congress at San Francisco, last year, pointed out that the use of a controlling shaft or, as he terms it, a "lay shaft," constitutes a separate type of control. A machine with this type of control is shown in Fig. 5, where the shaft 15 drives the various mechanisms, except the spindle, and by means of clutches controls their operations.

The shaft 7 in Fig 1 may also be said to be another type of controlling shaft, as through the interposition of dogs and levers it controls the various operations of the machine although it does not drive them. It is an application to what Mr. Flanders terms the screw feed type of machine. The Bullard machine, Fig. 13 is also of this type.

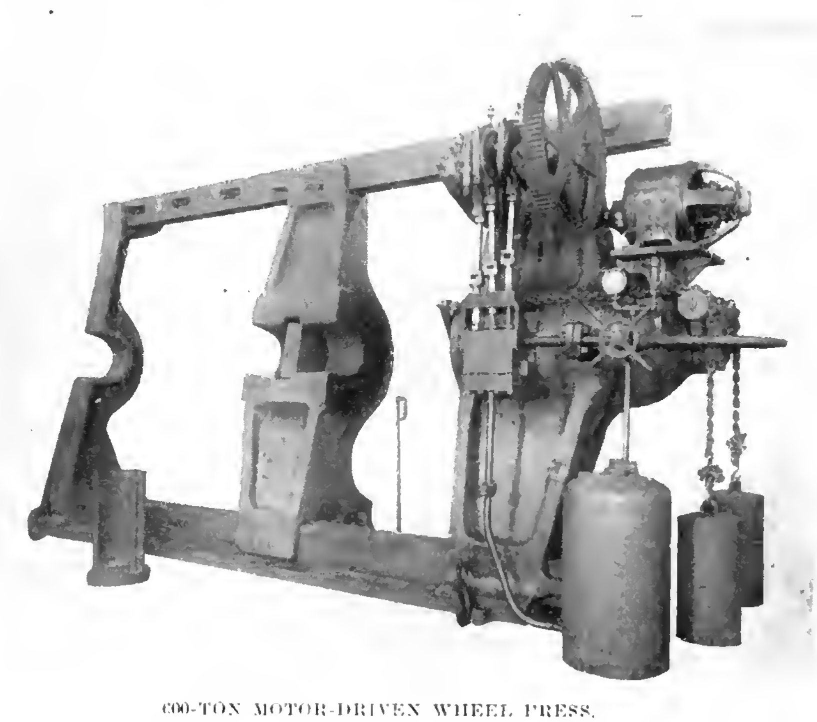
SIX HUNDRED TON WHEEL PRESS

A WHEEL press for operating on locomotive driving wheels is shown in the accompanying illustration. This machine is of ample size and strength to handle work of the heaviest class, the ram exerting a total pressure of 600 tons while the vertical space between the tie bars in 96 inches.

Four adjustments are provided for the resistance post which is carried on rollers running on the lower tie bar which forms the bed of the machine. This post is traversed when necessary by means of the hand lever shown next it.

The press, at the right hand end, carries the ram, along with a triple plunger air pump, and a 15 horse-power motor. The pump is connected to a filling tank, supplying the air at 80 lbs. pressure, per sq. in. Large counter weights are used for drawing back the ram.

Complete with base, the press weighs 50,000 lbs. and is built by the Southwark Foundry and Machine Co., Philadelphia., Pa.



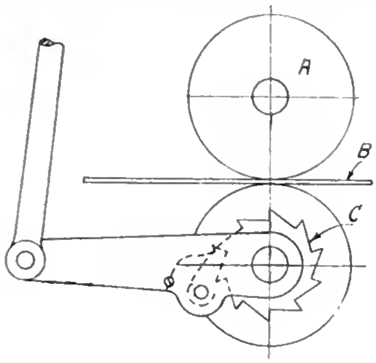
600-TON MOTOR-DRIVEN WHEEL PRESS.

Series of Practical Questions and Answers for Mechanics

Every care is being taken to include only pertinent practical questions, and give same direct, reliable answers. Catch questions will be avoided. Arithmetic, consisting of simple addition, subtraction, multiplication and division will be found a useful companion study.

Question.—In the sketch shown, what should be the diameter of the feed rolls A, to advance the strip B, one inch for each notch of the ratchet wheel C; the pitch diameter of the gears being 3 inches?

Answer.—As there are ten teeth in the ratchet wheel, the circumference of

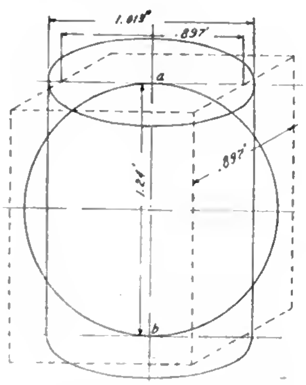


the feed rolls will be 1 × 10 = 10 in. Therefore, the diameter of each roll should be 10 ÷ 3.1416 = 3.119 inches.

* * *

Question.—What shape tank will contain the largest quantity of liquid with the least possible material?

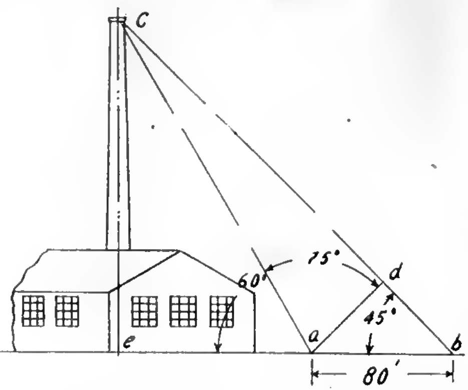
Answer. — Without taking into consideration the seams or joints the sphere has the greatest volume for surface exposed, or in other words the material used to hold the contents. The comparative sizes of a sphere, cylinder and square prism of equal heights, each of which will contain one cubic foot, are



shown in the accompanying sketch. The sphere, with a volume of 1 cu. ft., has a diameter of 1.24 ft. and a surface of 4.83 sq. ft. The cylinder with a height of 1.24 feet has a diameter of 1.013 feet and a total surface of 5.56 sq. feet. The square prism with a height of 1.24 ft. has a side of .897 feet and a total surface of 6.063 sq. feet.

Question.—How can the height of a chimney or high object be determined?

Answer. — This can be found from observation and calculation of angles, as shown in the sketch. By taking observations from two points at a known distance apart, it is possible to solve by trigonometry the desired height. For instance, to find the height of the chimney shown; suppose from the point (a) it is found that a 60 degree inclination will cut the top of the stack. We will assume that at the point (b), eighty feet away, in a direct line from the chimney or object being observed, a sight line of 45 degrees inclination, also cuts the top of stack. Now to find the height c e it is necessary to solve the triangle a b c. To do so it is necessary to form two right triangles by drawing the line a d perpendicu-



lar to the line b c. To find the length of the sides of a right triangle, the two acute angles being equal or 45 degrees, you extract the square root of one-half of the square of the diagonal or hypotenuse, thus:

$$b\ d = \sqrt{\frac{(a\ b)^2}{2}} = \sqrt{\frac{80^2}{2}} = 56.568 \text{ ft.}$$

This is also the length of the line a d.

To find the length c d, use the formula side opposite = side adjacent × tangent or c d = a d × tan. of angle of 75 degrees = 56.568 × 3.73205 = 211.115 ft. Then b c = 56.568 + 211.115 = 267.683 feet. We now have the right triangle c e b, with the length c b known; therefore, c e will equal $\sqrt{\frac{(c\ b)^2}{2}} =$

$$\sqrt{\frac{267.683^2}{2}} = 189.28 \text{ feet, the height}$$

of chimney.

* * *

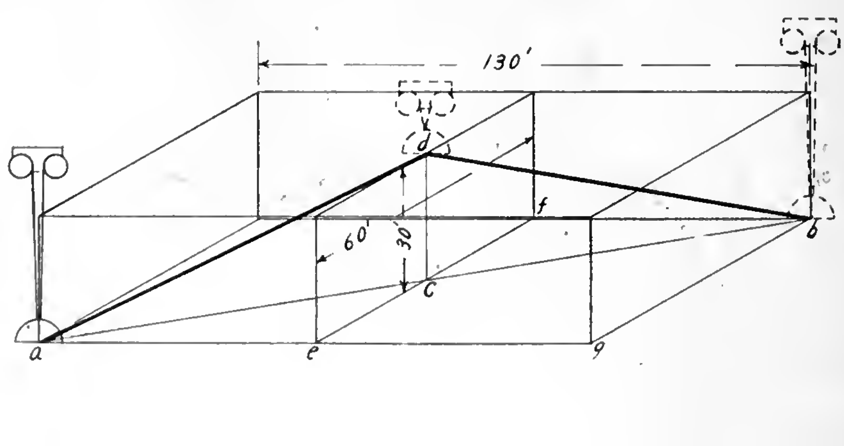
Question.—What weight can be raised by a screw jack, with a ¼ inch pitch screw, a force of 50 lbs. being applied at the end of a 30 inch lever, friction being taken at 5 per cent.?

Answer.—During each revolution the work expended would be equal to the pressure applied multiplied by the distance through which it moves, or 50 × 30 × 2 × 3.1416 = 9424.8 inch lbs. Therefore, the weight raised would be the work expended divided by the height raised, or 9424.8 ÷ .25 = 37699 lbs. or about 19 tons.

* * *

Question.—A weight is picked up by a crane from the floor at one corner of a shop and transmitted to the opposite end and corner in ¾ of a minute. During its progress across the shop it is elevated to a height of 30 feet. If the shop is 130 feet long and 60 feet wide, what is the average velocity of the weight in feet per second?

Answer.—If the motion of the weight is constant, that is, moving in the three directions at the same time, the path of the weight will be over the heavy line a d b, therefore, it will be necessary to find the length of this line. The plan of this path will be the diagonal a b. To find the length of this line we extract the square root of the sum of the square of the length and the square of the width, or $a\ b = \sqrt{(a\ g)^2 + (b\ g)^2} = \sqrt{130^2 + 60^2} = \sqrt{20500} = 143.178$ feet. Then a c will equal 143.178 ÷ 2 = 71.589 feet.



Then a d will equal the square root of the sum of the square of a c and the and square of cd, or $\sqrt{71.589^2+30^2} = \sqrt{6024.9849} = 77.62$ feet. The distance passed over by weight will therefore be $77.62 \times 2 = 155.24$ feet.

The velocity in feet per second will be the space divided by the time, or

$$\frac{155.24}{\frac{3}{4}\text{ of }60} = \frac{155.24}{45} = 3.45 \text{ ft. per sec.}$$

* * *

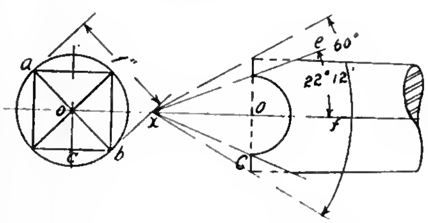
Question. — What chemical treatment is used in the re-sharpening old files?

Answer.—The files are first cleaned of loose grit and then boiled for nearly an hour in a solution of ¼ lb. of saleratus to a quart of water. After thoroughly washing in clear water, they are submerged, in a vertical position, in an acid solution of ¼ lb. of sulphuric acid to a quart of water, and allowed to remain for about 12 hours. After removal and washing in clean water they are then given a thin coating of oil to prevent rusting.

* * *

Question.—On page 84 of the January 27 issue of Canadian Machinery there appeared a "Round Shaft Query". which brings to mind a similar problem on the milling of square centers. When milling a four sided square centre to retain a cutting angle of 60 degrees what angle of inclination is necessary?

Answer.—The triangle formed by a central section of a 60 degree center would be an equilateral triangle; therefore the slanting length would equal the



diameter of the stock. With a diameter of one inch, the distance x o would be found from the formula $\sqrt{\text{hypotenuse}^2 - \text{side}^2}$, or $\sqrt{1^2 - .5^2} = \sqrt{.75} = .866$ inch.

As the triangle o c b is a right triangle with two 45 degree angles, the length of one side can be found by the formula,

$$\text{side} = \sqrt{\frac{\text{diagonal}^2}{2}} = \sqrt{\frac{.5^2}{2}} = \sqrt{.125} = .3535 \text{ inch.}$$

Then by formula:

$$\text{tangent} = \frac{\text{side opposite}}{\text{side adjacent}} = \text{tangent of}$$

$$\text{angle } o\,x\,c = \frac{.3535}{.866} = .40819,$$

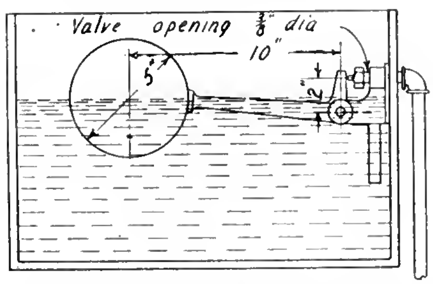
and corresponding angle equals 22 degrees 12 minutes.

Question.—I have sometimes seen a mechanic pass a drill over a flame a few times before using. What would be the purpose of this operation?

Answer.—In many instances hardened steel is extremely brittle when cold, and it is generally speaking good practice to warm a carbon or high speed drill or reamer before using. Such a proceeding often prevents breakage, and in fact high speed drills invariably operate much better when warm, often performing the best work when blue chips are produced from the heat generated. The efficiency of a twist drill is sometimes seriously impaired by suddenly plunging it into cold water after being heated from grinding or drilling. Such a practise may result in a number of small invisible cracks developing, to be followed later by a break.

* * *

Question.— (a) Neglecting the weight of the ball and lever, what is the pressure exerted on the valve spindle shown in the sketch, when the ball is half submerged?



(b) What would be the reacting pressure per sq. inch if the valve opening had a diameter of ⅜ inch.

Answer.—(a) The water displaced by the half submarged ball will be

$$\frac{5^3 \times .5236}{2} = 32.725 \text{ cu. in.}$$

Weight of this volume of water will be $.03617 \times 32.725 = 1.184$ lbs. Then the pressure on the spindle will be

$$\frac{1.184 \times 10}{2} = 5.920 \text{ lbs.}$$

(b) The area of the valve opening will be $(\frac{3}{8})^2 \times .7854 = .1104$ sq. in. and the reacting pressure will be $5.92 \div .1104 = 54$ lbs. per square inch.

A MILLING FIXTURE

By D. S. Mann.

THE fixture shown in Fig 2 was designed for milling the sides of the bosses of the drop-forged rocker arm, shown in Fig. 1. To facilitate this work both

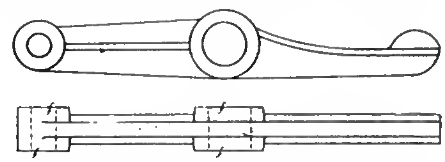


FIG. 1—DROP FORGED ROCKER ARM

bosses were made of the same length. To the base A is bolted the steel upright C, in which are cut the two vees for carrying the rocker arm; it being necessary to mill a groove through the centre for the rib clearance. The width of this upright must, of course, be slightly less than the length of the bosses. The piece is held in position by the steel arm B, which is pivoted at the other end and held away from the work when released by the spring S. The clamping effect is obtained from the hand-operated eccentric H. This makes a very quick-operating fixture, and one which is quite rigid and at the same time simple and fairly cheap to construct.

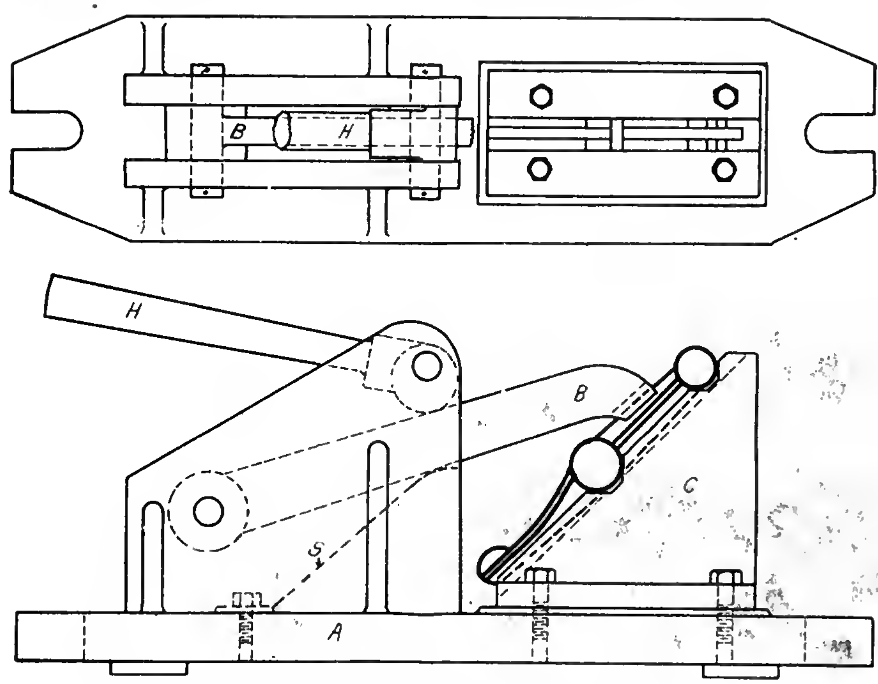


FIG. 2.—MILLING FIXTURE FOR DROP-FORGED ROCKER ARM

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

TWO THOUSAND TON EXTRUSION PRESS

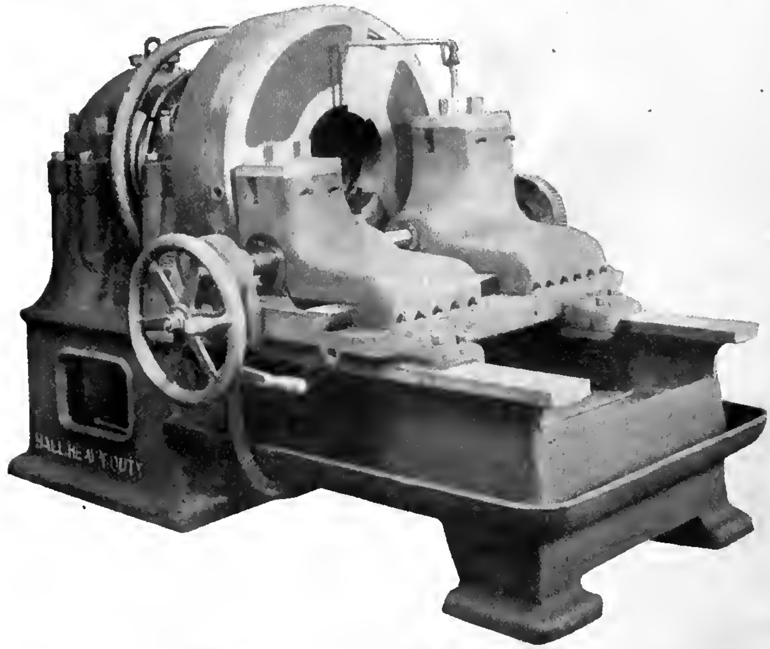
THE press illustrated herewith is designed for the purpose of producing extruded rods. It is a product of the Southwark Foundry & Machine Co., Philadelphia, Pa., and is so designed that, when operated with their system of control, rapid production is obtained with a minimum expense for power and toll replacement.

The machine as shown is arranged for extruding 5¾ in. diameter billets, 25 in. long, weighing about 200 lbs. each, and will extrude up to 30 billets per hour, according to the ability of the operator. It is mounted on a cast iron bed plate, and is of the four column type, with a clear distance between columns of 42 in. horizontally and 38 in. vertically.

All of the parts are either steel castings or forgings except the main ram and some minor parts which are made of close grained cast iron. The pressure cylinder is of forged steel and is provided with a jacket of cast steel. Between the pressure cylinder and jacket, an open space is provided through which the heated gases from the fire place arranged beneath the pressure chamber can pass, thus maintaining the temperature of the pressure chamber at the required degree.

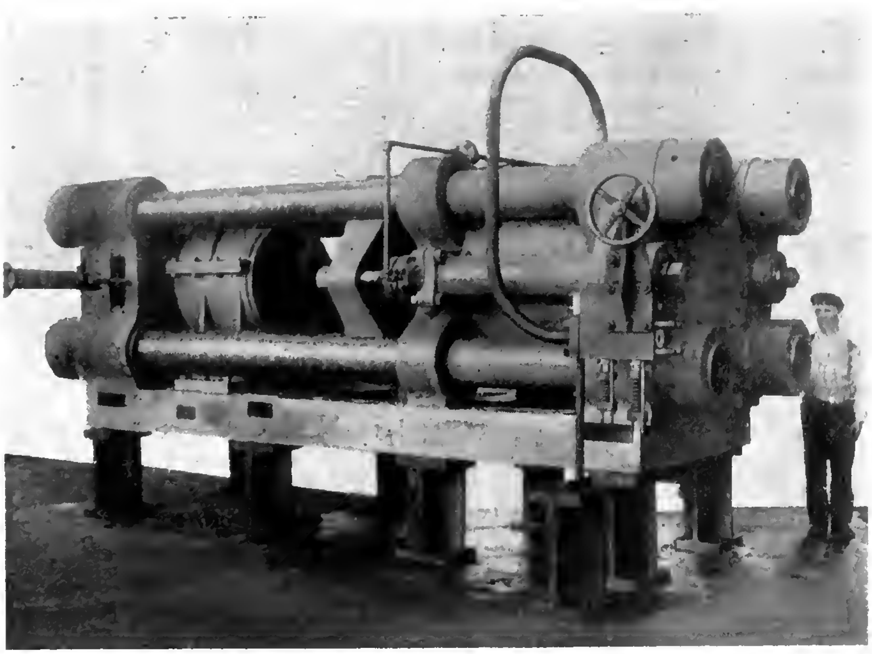
During the process of extrusion the walls of the pressure chamber are subjected to a high temperature, which, along with other conditions, demands the use of metal of an exceptionally high-grade. Numerous installations have proven the suitability of the metal used for this purpose.

A hydro-pneumatic tank is furnished with this press from which low pressure water is supplied to the main ram during the idle portion of the stroke, at the end of which the working pressure of 4,000 lbs. per sq. in. is employed. The use of an accumulator of ample capacity has a beneficial effect on the life of the dies and containers compared with operating directly from a pump. With this method in use, no annealing is required, and only one draw is necessary to finish the extruded rods.



HEAVY DUTY CUTTING-OFF LATHE.

A cast iron table 50 ft. long, is furnished to support the extruded rods, and between this table and the back head of the press, a 30 ton cutting-off press is arranged for cutting off the ram stump of the billets from the die block. The stroke of this press is long enough to draw hot copper tubes after the concontainer and container castings are removed.



2,000-TON EXTRUSION PRESS.

HEAVY DUTY CUTTING-OFF LATHE

THE accompanying illustration shows a High Speed, Heavy Duty Cutting-off Lathe which has been especially designed for work on large shells, ingots, and bar stock. The machine has a capacity of from 6 in. to 12 in. and the bed which is of the box lathe type possesses sufficient weight and strength to provide ample rigidity under severest working conditions.

The front part of the bed is cast with a solid bottom, which catches all the cuttings, and is inclined so as to allow the cutting lubricant to drain into a

reservoir of about one-quarter barrel capacity, cast integral with the bed in rear of machine.

The spindle is very heavy being 15 in. diameter with a 10½ in. long front bearing, and a 9½ in. long rear bearing. The bearings are of cast iron, removable and interchangeable, and are carried in supports cast solid with the bed. This feature removes all possibility of separate parts working loose under the continued strain and vibration involved in non-stop work at full load. The hole through the spindle is large enough to pass 12½ in. diameter.

Driving gears are of extra wide face, and all are made of steel except the large drive gear which has 5¼ in face and is made of gray iron. This gear is bolted direct to the driving chuck.

A three jaw independent chuck of extra heavy proportions is fitted. The jaws have wide bearings, removable interchangeable tool steel facings and phospor bronze nuts for the tightening screws to work in. Directly behind the front bearing is a universal scroll chuck, operated by a large hand wheel, for the purpose of supporting and centering the rear end of shell forgings, or bar stock.

The carriage is of massive construction, with long bearings on the bed, and is made so that it can be either bolted and locked to the bed, or clamped with the gibbs as required. It carries two tool blocks gibbed to the cross slide and fitted with heavy bronze nuts for the operating screw to work in. Tool slots in blocks will take 1½ in x 3 in. tools, but smaller can be used in preferred.

Feed screw is 2 3-16 in. diameter and is power operated through a worm wheel and clutch at the back end, the clutch being controlled by a feed lever near the hand wheel. The power feed is geared direct to the drive shaft and provision is made for altering the gear ratio to suit various conditions of work.

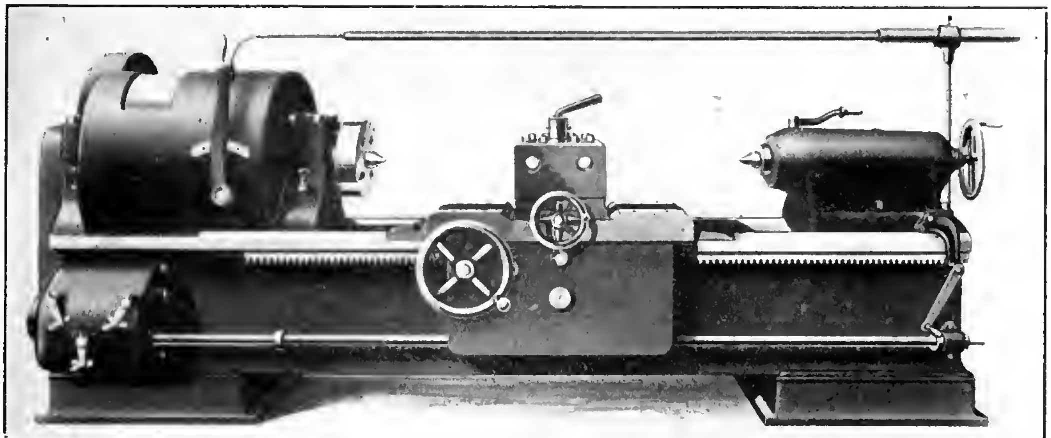
The machine is complete in every respect, including lubricant pump etc. Three speeds are obtained through the countershaft which carries three tight and three loose pulleys, the latter being provided with compression grease cups. At an extra cost, the machine can be equipped to make one, two, or three cuts separately or simultaneously.

John H. Hall & Sons, Ltd., Brantford, Ont., are the makers of this machine which weighs about 8,800 pounds, requires 10 horse-power, and occupies a floor space 5 ft. 6 in x 7 ft.

26 IN. HEAVY DUTY SHELL LATHE

AN excellent example of a single purpose machine tool is afforded by the 26 in. Simplex lathe illustrated herewith This machine is being marketed by Kellog & Co., Toronto, and is known as a heavy duty, geared head, single pulley drive shell lathe.

It is specially designed for machining shells of the larger sizes, up to and including 12 inch shells. The reduced swing over the vees is 26½ in.; swing over bridge, 15 in.; takes 5 ft. between centers on 12 ft. bed; weight of plain lathe crated, 13,500 lbs. approximately.


26-IN. SINGLE PURPOSE HEAVY DUTY GEARED HEAD SINGLE PULLEY DRIVE SHELL LATHE.

Four speed changes are available through the geared head and countershaft, a positive drive dog tooth clutch being incorporated in the head stock design. The drive pulley, 23 in. dia x 7¼ in. face runs at 400 revs. per minute, and transmits the power through steel gears running in oil, having gear ratios of 26½ to 1, and 18 to 1. All gears in head stock are bronze bushed, the two main gears being respectively 24 1-3 in. and 22 in. dia. x 4½ in. face, with teeth of 3 diametral pitch.

The hollow spindle is of high carbon steel, hardened and ground, with a 2½ in. hole. It is carried in cast iron ring oiling bearings with large oil reservoirs. Front bearing 8 in dia. x 9½ in. long; rear bearing 5 in. dia. x 7½ in. long.

The carriage has a length of bearing on vees of 42 in. and 15 in. width of cross bridge. Hand feed to cross slide is provided with automatic longitudinal stop to carriage. The shrouded box type of apron provides a double support for each stud and gear, all gears in apron being steel with exception of worm gear which is of semi-steel. A hardened steel worm on the feed shaft transmits the drive to apron gears, the gear reduction being 80 to 1.

A heavy tailstock of the offset pattern is provided with three clamping bolts which tighten the one piece clamp the full length of tailstock. The spindle is 4½ in. dia. x 9 in. travel, and has a double thread screw for quick traverse.

Six changes of feed are supplied, from 1-32 in. to ⅜ in. per revolution, power being transmitted by silent chain from spindle to feed box. All feed gears are steel.

The bed is very heavily constructed with liberal size ribs and two vees, and is planed on the back to receive standard forming attachment.

Double friction clutch pulleys, 18 in. dia., for 7 in. belt, with a main drive pulley, 27 in. dia. x 7½ in. face, are mounted on the countershaft, which should run at 425 revolutions per minute for 8 in. and 9 in. shells, and 362 revolutions per minute for 10 in. and 12 in. shells.

Attachments consisting of a four-hole turret, and forming attachment for interior operations, and four tool turret post with forming and waving attachments are obtainable as required.

MONTREAL - VANCOUVER TELEPHONE

The Bell Telephone Co. at Montreal on Feb. 14, successfully opened the Montreal-Vancouver line, said to be the longest ear-to-ear circuit in the world, 4,227 miles, the New York-San Francisco line, recently opened, being 3,400 miles in length. Lord Shaughnessy spoke to F. W. Peters, superintendent of the C. P. R. in Vancouver; Sir Frederick Williams-Taylor talked to Douglas R. Clarke, at the Vancouver branch of the Bank of Montreal; and Ald. Boyd, of Montreal, congratulated Mayor McBeath of Vancouver, on his election. The telephone line is not direct through Canada, but runs via the following connecting points: Buffalo, Chicago, Omaha, Salt Lake City, and Portland, Oregon. The cost of a conversation from Montreal to Vancouver is $22.15 for the first three minutes, and $6.95 for each additional minute. The cost from Toronto to Vancouver is $20.15 for the first three and $6.30 for each additional minute.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager
PUBLISHERS OF
CANADIAN MACHINERY
AND MANUFACTURING NEWS
A weekly newspaper devoted to the machinery and manufacturing interests.
PETER BAIN, M.E., Editor.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.
B. G. NEWTON - - - - - Advertising Manager
Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. FEBRUARY 24, 1916 No. 8

ONTARIO REFUSES RUSSIAN 15-PDR. SHELL CONTRACTS

A FEW weeks ago we made official intimation of the fact that the Imperial Munitions Board had acquired from the Canadian Car & Foundry Co., of Montreal, for distribution among Canadian shell manufacturers, a block of half a million Russian 15-pdr. high explosive shells, at a price for machining of $1.85 per shell, providing individual quantity contracts placed were fulfilled by the end of July, this year. From interests quite close to shell making, inspiration of refusal to have anything to do with this particular projectile emanated and had the tendency to, and incidentally resulted in the Imperial Munitions Board and the Canadian Car & Foundry Co. being placed in an altogether unfavorable light. The former's effectiveness as an institution capable of procuring, to the fullest extent possible, a supply of British shell orders — all sizes and types, was impugned, while the latter were made to appear as being only too glad to saddle Canadian shell makers with something that numbers of their sub-contractors in the United States had fallen down on.

We are in a position to state that one-half or 250,000 of the half million Russian shells acquired by the Imperial Munitions Board have been placed in Montreal, two firms there having accepted that quantity between them. Further, the balance, 250,000 Russian 15-pdr. high explosive shells intended for Western Ontario points, has been cancelled as a result of the contract refusal propaganda.

THE NEW TAXATION FOR WAR PURPOSES

THE proposed new taxation for war purposes, disclosed in the Dominion Budget on February 15, is of more than ordinary interest to our commercial and industrial communities, the sources from which the additional revenue will be realized belonging almost entirely to these sections. Taken as a whole, the proposals have met with at least friendly criticism and with what might be termed passive approval, even on the part of those to whom the taxation will make its presence most heavily felt. It was hardly to be expected that any scheme of revenue provision, however carefully devised and worked-out would be unerring in its application and unreserved in its scope; our economic fabric is too diversified in its operation features, and too complex in its individual structure for results to be otherwise.

The most readily apparent weakness or shortcoming is to be found in the proposal to collect a tax of 25 per cent. on the net profits in excess of 7 per cent. since the beginning of the war, from financial, industrial, milling, transportation, public utility and other corporations, also munitions manufacturing concerns. We refer to the capitalization protection. Many of our industrial and commercial enterprises are so "loaded up," so to speak, with capital, and, as a matter of fact, so shy on a much-less-than 7 per cent. net revenue, that the proposed war tax will not even begin to have a look in. Others again, and most of our metal-working plants will figure largely under this latter head, are very moderately capitalized; the natural inference being of course that they will bear the brunt of the new impost.

In the week that has elapsed, increasing attention has been given this capitalization feature, and ere final parliamentary approval is given to the proposals as a whole, we expect to see such amendments incorporated as obviate, making "fish of some and flesh of others." By saying that friendly criticism and passive approval have marked the appearance of the Dominion of Canada Budget for the ensuing year, we refer entirely to the general attitude taken as regards the necessity of meeting our war-time expenditure, and the willingness to do so. Resentment will, however, be quickly aroused if steps be not taken to make impossible from exclusion, or of making a relatively disproportionate contribution, those corporations with heavy capitalization to their credit, and in addition the anomaly of meagre earnings.

ONTARIO GOVERNMENT TO MERGE ITS INDUSTRIAL DEPARTMENTS

NOTICE has been given of an interesting piece of legislation which will be brought forward at the coming session of the Ontario Parliament. It will involve the merging into one department, and under the direction of one responsible head or general superintendent, of the Labor Bureau, Factory Inspection, Steam Boiler Inspection, and Stationary Engineers' License administrations. We understand such a move has been under consideration for some considerable time past, and that the plans for giving effect to the reorganization as outlined are now fully matured. The Parliamentary head of the new establishment will be the Hon. Finlay MacDiarmid, Provincial Minister of Public Works.

The legislation proposed is such as to awaken the keenest interest in industrial circles, embracing as it does the whole wide field of provincial manufacturing and commercial enterprise. Progressiveness may perhaps be the most concise and at the same time sufficiently comprehensive phrase to employ regarding the coming development, and properly recognized as such, little difficulty will be experienced in placing the enactment on the Statute Book.

Heterogeneous fitly expresses the existing conditions relative to labor, factory inspection, steam boiler inspection, and stationary engineers' license departments of the Province of Ontario, and in placing all of them under the wing of the Minister of Public Works, a quite appreciable advance in the direction of greater efficiency cannot fail to be registered. All of the sections involved in the proposed merger can easily be extended in scope, usefulness and efficiency through the appointment and instrumentality of a thoroughly qualified Deputy Minister or general superintendent.

INDUSTRIAL NOTABILITIES

JOSEPH WESLEY FLAVELLE, LL.D., chairman, Imperial Munitions Board; president, William Davies Co., Toronto, Ont.; president, National Trust Co.; director, Canadian Bank of Commerce; vice-president, The Robert Simpson Co.; vice-president, Toronto Penny Bank; director, Imperial Varnish & Color Co.; director, John Murphy Co., Montreal, Que.; director, Harris Abattoir Co., was born of Irish origin, near Peterborough, Ont., February 14, 1858, the son of the late John and Dorothea (Dundas) Flavelle. He was educated at the Public and Grammar Schools in Peterborough, and in early years engaged in the pork packing and provision business with his father there. He removed to Toronto in the year 1887.

Mr. Flavelle is a Councillor of the Canadian Branch, British Red Cross Society; was chairman Toronto Board of License Commissioners, 1905; member International Commission on Bovine Tuberculosis, 1909; is a Governor, Toronto Branch, Victorian Order of Nurses; governor Toronto University; founded a Travelling Fellowship in Classics, Toronto University, 1905; was created

JOSEPH WESLEY FLAVELLE, LL.D.

LL.D., Toronto University, 1906; was chairman of Royal Commission to recommend a plan to reorganize Toronto University; chairman Board of Trustees, Toronto General Hospital; member General Board of Missions, Methodist Church; endowed a Chair in Hebrew, Victoria University; was one time owner of Toronto Daily News, and is a liberal subscriber to charitable and patriotic funds.

Mr. Flavelle's recent appointment to the Chairmanship of the Imperial Munitions Board has opened a new field for the exercise of his nature-endowed administrative qualifications, and incidentally has brought him into close touch with the activities of Canadian metal-working plants engaged in munitions manufacture for the British Government. As was to be expected from his successful business and other experiences, his work on the Imperial Munitions Board bids fair to at least equal, if not surpass, his best previous achievements.

Mr. Flavelle married Miss Clara Ellsworth, daughter of Orrin Hamilton Ellsworth, on September 29th, 1881, his family consisting of one son (J. Ellsworth Flavelle) and two daughters.

His residence is "Holwood," Queen's Park, Toronto; his clubs, the York, Albany, National and Queen City Curling, Toronto, and the Mount Royal, Montreal. His recreations are golf, fishing and outdoor sports generally. In politics Mr. Flavelle is Conservative, and in matters religious a Methodist.

Photo. Courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Montreal.	Toronto.
Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	
Middlesboro, No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	.....
Victoria, No. 2X	26 00	.....
Victoria, No. 2 plain	26 00	.....
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	2.75
Steel bars, 2 in. and larger, base	4.00
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	3.00
Warehouse, Freight and Duty to Pay.	**Cents.**
Steel bars	2.60
Structural shapes	2.60
Plates	2.80

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$30 50	$30 50
Electrolytic copper	30 50	30 50
Castings, copper	29 50	30 00
Tin	46 50	47 00
Spelter	23 00	24 00
Lead	8 00	8 25
Antimony	50 00	47 00
Aluminum	69 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, ¼ to ½ in., 100 lb.	$3 00	$3 25
Heads, per 100 lb.	3 20	3 45
Tank plates, 3-16 in.	3 25	3 55

WROUGHT IRON PIPE

Prices in effect Feb. 18, 1916

Buttweld

Per 100 feet	Black	Galv.
¼ and ⅜ in.	$ 2 64	$ 4 41
½ in.	3 32	5 14
¾ in.	3 91	6 38
1 in.	5 78	9 44
1¼ in.	7 82	12 77
1½ in.	9 35	15 26
2 in.	12 58	20 54
2½ in.	19 89	32 47
3 in.	26 01	42 46
3½ in.	31 28	51 06
4 in.	37 06	60 50

Lapweld

Per 100 feet	Black	Galv.
2 in.	14 06	22 02
2½ in.	20 48	35 05
3 in.	26 78	43 22
3½ in.	32 20	51 98
4 in.	38 15	61 59
4½ in.	48 26	75 57
5 in.	56 24	88 06
6 in.	72 96	114 24
7 in.	99 96	153 50
8 in x 25 lbs. per ft.	105 00	161 25
8 in.x28 lbs. per ft.	120 96	185 76
9 in.	144 90	222 53
10 in.x32 lbs. per ft.	134 40	206 40
10 in.x40 lbs. per ft.	173 04	265 74

Ontario list—All points from Kingston and west to, but not including Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
¼ in. and ⅜ in.	$ 2 58	$ 4 35
½ in.	3 23	5 06
¾ in.	3 80	6 27
1 in.	5 61	9 27
1¼ in.	7 59	12 54
1½ in.	9 08	14 99
2 in.	12 21	20 17
2½ in.	19 31	31 88
3 in.	25 25	41 69
3½ in.	30 36	50 14
4 in.	35 97	59 41

Lapweld

Per 100 feet	Black	Galv.
2 in.	13 69	21 65
2½ in.	19 89	32 47
3 in.	26 01	42 46
3½ in.	31 28	51 06
4 in.	37 06	60 50
4½ in.	46 99	74 30
5 in.	54 76	86 58
6 in.	71 04	112 32
7 in.	97 58	151 13
8 in. x 25 lbs. per ft.	102 50	158 75
8 in. x 28 lbs. per ft.	118 08	182 88
9 in.	141 45	219 08
10 in. x 32 lbs. per ft.	131 20	203 20
10 in. x 40 lbs. per ft.	168 92	261 62

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 50	$17 50
Copper, crucible	20 75	20 75
Copper, unch-bled, heavy	20 50	20 50
Copper wire, unch-bled	20 50	20 50
No. 1 machine compos'n	16 25	16 25
No. 1 compos'n turnings	13 50	13 50
New brass clippings	13 25	13 25
No. 1 brass turnings	11 00	11 00
Heavy melting steel	9 00	10 00
Boiler plate	11.75	19.00
Axles, steel	13.00	15.00
Axles, wrought iron	18.00	19.00
Tires, steel	11.75	10.50
Rails	13.00	13.00
Shafting	15.00	16.00
Malleable scrap	10.00	12.00
Pipe, wrought iron	8.50	9.00
Stove plate	8.50	8.50
No. 1 wrought iron	11 75	11 00
No. 1 machin'y cast iron	14 75	14 00
Heavy lead	6 00	6 00
Tea lead	5 00	5 00
Scrap zinc	15 00	15 00
Aluminum	34 00	34 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	65
Stove bolts	75
Plate washers	35
Machine bolts, ⅜ and less	57½
Machine bolts, 7-16 and over	47½
Blank bolts	47½
Bolt ends	47½
Machine screws, flat head, iron66	35
Machine screws, fl & rd. hd, brass	12½
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, square, all sizes	3c per lb. off
Nuts, hexagon, all sizes	3¼c per lb. off
Copper rivets and burrs, list plus	15
Burrs only, list plus	30
Iron rivets	60
Boiler rivets, base, ¾-in. and larger	$4.10
Structural rivets, as above	4.00
Wood screws, flathead, bright	85 p.c. off
Wood screws, flathead, brass	50 p.c. off
Wood screws, flathead, bronze	45 p.c. off

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$33 00
Open-hearth billets, Pittsburgh	35 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	50 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 20	$3 15
Cut nails	3 15	3 20
Miscellaneous wire nails	75 per cent.	
Pressed spikes, 5/8 diam., 100 lbs.	3 75	

MISCELLANEOUS

Solder, half-and-half	0.25
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.37
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	11.45
Red dry lead, 100-lb. kegs, per cwt.	11.50
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.28½
Benzine, single bbls., per gal.	0.28
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	1.02
Linseed oil, boiled, single bbls.	1.05
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	5.50
Lead Wool, per lb.	0.11
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	55
Standard drills over 1½ in.	30
3-fluted drills to 1½ in.	30
3-fluted drills over 1½ in.	20
Bit stock	65
Ratchet drills	30
Machine bits for wood	30 and 5
S.S. drills for wood	55
Wood boring brace drills	40
Electricians	35
Sockets	55
Sleeves	55
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	10
Drills and countersinks	5
Bridge reamers	55
Centre reamers	15
Chucking reamers	15
Hand reamers	15 and 5

High speed drills and reamers are double the list price plus 5 per cent.

COLD ROLLED SHAFTING

At mill	10%
At warehouse	Net

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$3 75
Canada plates, dull, 52 sheets	4 00	4 00
Canada Plates, all bright	5 25	5 25
Apollo brand, 10¾ oz. galvanized	6 75	6 75
Queen's Head, 28 B.W.G.	7 25	7 25
Fleur-de-Lis, 28 B.W.G.	7 00	7 00
Gorbal's Best, No. 28	7 25	7 25
Viking metal, No. 28	7 00	7 00
Colborne Crown, No. 28	6 75	6 75
Premier No. 28, U.S.	6 25	6 15
Premier, 10¾ oz.	6 90	6 80

PROOF COIL CHAIN.

¼ in.	$7.85
5-16 in.	6.50
⅜ in.	5.75
7-16 in.	5.55
½ in.	5.35
9-16 in.	5.35
⅝ in.	5.20
¾ in.	5.10
⅞ in.	4.95
1 inch	4.80

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B.B

⅛ in.	$14.00
3-16 in.	10.45
¼ in.	7.15
5-16 in.	5.65
⅜ in.	4.60
7-16 in.	4.60
½ in.	4.60
⅝ in.	4.45
¾ in.	4.45

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	72½
Kearney & Foot, Arcade	72½
J. Barton Smith, Eagle	72½
McClelland, Globe	72½
Black Diamond	60—10
Delta Files	62½
Nicholson	60—10
Globe	72½

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$18 70	......
1¼ in.	18 70	......
1½ in.	18 70	12 70
1¾ in.	22 00	12 70
2 in.	22 00	12 10
2¼ in.	24 20	13 30
2½ in.	26 40	15 95
3 in.	35 20	16 06
3½ in.	38 50	19 80
4 in.	44 00	25 30

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.38
Royalite, per gal.	.13½
Machine oil, per gal.	.23
Black oil, per gal.	.13½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	.04¾
Lard oil, per gal.	1.28
Thread cutting oil	.54
Imperial quenching oil	.38

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble, 40 & 10%	
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.15¼
Peerless	.15¼
Grand	.14¼
X L C R	.13¼
Atlas	.13¼
X Empire	.12¼
X press	.11¼
COLORED.	
Lion	.09½
Standard	.08¾
No. 1	.08¾
Popular	.07¾
Keen	.06¾
WOOL PACKING.	
Arrow	.20
Axle	.15
Anvil	.11
Anchor	.09
WASHED WIPERS.	
Select White	.09
Mixed Colored	.07
Dark Colored	.05½

This list subject to trade discount for quantity.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy	.35
Copper sulphate	.22
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.32 to .33
Tin	.48 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs	.07 to .08
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., Feb. 21, 1916.—The general industrial situation shows little change from that of a week ago, although the embargo placed on export shipments by the Pennsylvania Railroad has interfered with shipments to Canada, and caused considerable inconvenience locally. The expected shortage of ocean tonnage during the coming season is causing much anxiety here, as it is feared that the port of Montreal will not benefit by the heavy increase in exports as much as if sufficient tonnage were available. In any event, warehouse space will be severely taxed. The Montreal Harbor Commissioners have issued their annual report dealing at length with the work done in recent years, and the proposed improvements to be undertaken in the near future.

Pig Iron

A fair inquiry is reported for foundry pig, and it is expected the demand for this grade of iron will gradually increase. The requirements of the steel mills are keeping the producers of steel making pig busy, and the prospect for future activity seems very bright. Local prices are normal, but holding firm.

Steel

The remarkable condition throughout the iron and steel industry is apparently unchanged. The strength of the market is largely due to the pressure being exerted upon the mills for current delivery, as the demand for new domestic business is below normal. However, the requirements of the war continue to occupy the attention of steel producers to such an extent that any relief whatever is most acceptable; but the general belief is that little pressure will be removed from the steel mills for the remainder of the year; in fact, indications point to present conditions extending over a much longer period.

With the continuation of hostilities the probabilities point to a further curtailment of domestic demands, as the handicap of abnormal prices is greater than construction companies can well overcome, unless the case is one of absolute necessity. However, it is encouraging to note that some large orders for various purposes, apart from the war, are being considered, and in the event of an early cessation of hostilities, it is felt that the domestic developments would be resumed with considerable activity.

Bessemer billets and sheet bars (f.o.b. makers' mill, Pittsburg) show an advance of $2 a ton; open-hearth billets and sheet bars have advanced $3 a ton, quotations being $35 and $38 respectively. Blue annealed and galvanized sheets are very strong and firm, with prices nominal. I.C. terne plate (Pittsburg) is easier, having declined to $3.60.

All wire products have taken on strength recently, and are quoted at advanced prices, the increase being 10c per hundred pounds. Pittsburg prices are: Plain wire, $2.15; galvanized wire, $2.85; wire nails, $2.30; painted barb wire, $2.45; galvanized barb wire, $3.15. No change is noted in proof coil chain, but advances may be expected.

Metals

The trend of the metal market is ever upward, and indications point to a very unsettled situation, especially in copper, and there seems to be no end to the demand even at the constantly advancing prices; in fact, some are looking forward to a runaway market, as it seems impossible for anyone to describe the present remarkable situation. Although refiners are producing more copper than ever before, many are obliged to refuse orders from their regular customers. Considerable activity is taking place in tin, and a strong export demand for lead has developed lately. A scarcity of antimony has developed a strong market, and all quotations are nominal.

Copper.—The present condition of the copper market is unchanged, and the feeling of uncertainty is very evident on all sides. The abnormal situation prevailing throughout the copper world is largely, if not entirely, due to war conditions, and it is very unlikely that much metal is being purchased at present prices unless the demand is absolutely necessary. Additional war orders are being received almost daily, and this adds to the pressure upon producers of all necessary materials. In view of the outlook, many consumers, dubious of future conditions, are insuring themthemselves by acquiring safety stocks against possible contingencies.

Little excitement is apparent, however, and no reliable information can be had on early deliveries, even at handsome premiums. Spot metal is almost impossible, and nearby is quoted as high as 29.50 (New York) and declining to 27 for June and later delivery. Consumers in many cases are offering any price for immediate delivery.

Local dealers report good business at the high prices. Present quotations show

an advance of ½c over last week; lake and electrolytic are quoted at 30½ cents and castings at 29½ cents per pound.

Tin.—The demand for tin, while not as pronounced as war munitions metal, continues very good. After a period of comparative dullness, considerable buying has been going on during the past week, and following the advance noted in foreign markets, local dealers have advanced their quotations a little, and report trade very good. The quotation of $46.50 shows an advance of ½c a lb.

Spelter.—Following the quiet of the early part of the week, the market has developed considerable strength and activity. Spot and early delivery is hard to get, and some producers appear filled up for April. Buyers do not seem anxious to book far in the future, but the present outlook indicates increased interest in second and third quarter metal. Advices from London report an advance of £6 per ton, and this has had the effect of strengthening the market here. An advance of 1 cent a pound brings this week's price up to 23 cents.

Lead.—The general situation is unchanged, and the market is featureless. The shipping question has been, and still is, causing uneasiness. However the prospect of improvement in the near future is encouraging, and the anxiety of dealers is decreasing.

Foreign reports show an advance, but local dealers are holding firm at last week's price of 8 cents per lb.

Antimony.—During the past week an active demand for early delivery developed a stronger market, and sales are reported for February, March and April shipments from the East at record high prices. Owing to further restrictions on the trade of antimony, placed by the British authorities, it is expected that additional inconvenience will be experienced for a time, as they propose to keep in close touch with the future supply and its points of destination.

Dealers here report unchanged conditions with quotations firm at 50 cents., with a feeling that prices may advance shortly.

Aluminum.—After a spell of firmness with unchanged prices, the market during the week has taken on considerable activity. Inquiries are fair and trade is very good. An advance of 1 cent is quoted, this week's price being 69 cents per pound.

Machine Tools and Supplies

Inquiries for machine tools are gradually dropping off, but the demand for present requirements are still great.

Some buyers are not very enthusiastic over purchasing machine tools, which owe their existence to prevailing conditions preferring to obtain standard machines, which would be of universal service at the close of the present crisis.

The small tool supply continues to be a feature in the machine working industry, as the abnormal steel situation has had its effect upon all auxiliary lines. All small supplies are in great demand, and consumers are often unable to secure the full amount of their placed orders.

Old Materials

The situation continues to show the abnormal condition that has prevailed in old material for many months. The requirements of the steel industry are again calling for increased quantities of heavy melting scrap. As a large proportion of steel production is leaving the country, the available supply of scrap is becoming limited, and consumers are endeavoring to obtain sufficient quantity for their possible needs.

The large consumption of copper for war munitions is creating a great demand for scrap metal of all descriptions, and exceptionally high prices are being paid for any class of old copper. The recent demand for aluminum has advanced the price of the old metal, and the available supply is commanding high prices. Scrap zinc is also very strong and in good demand. All coppers have advanced ¼c a pound. No. 1 machine composition advances ¼c, being quoted at 16¼c a lb.

Aluminum scrap advances from 32c to 34c, and scrap zinc is quoted at 15c, being an advance of ½c.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Toronto, Ont., Feb. 22.—The chief topic of the week has been the budget speech containing the proposed business tax. While the proposals constitute a new method of taxation in Canada and are far reaching in effect, they are being generally well received in business circles, the necessity for increased revenue being recognized. Some features of the proposed measure in their application require explanation, which will no doubt be forthcoming in due course. The tax will affect machine tool builders and dealers, the latter in the majority of cases being allowed 10 per cent. profit on capital before the surplus is touched. The most encouraging feature of the budget was the reference to the prosperity in Canada and the large increase in revenue, being $31,000,000 over the same period of the preceding year. The grand total revenue was $20,000,000 in excess of the estimate, the largest proportion of the revenue being derived from Customs.

The general industrial situation continues satisfactory, although the local teamsters' strike has caused considerable delay to the shipment of goods. Prices of raw materials are still advancing, and deliveries from manufacturers show no improvement. Higher prices for a number of iron and steel products have recently been registered. New prices for wrought iron pipe have been announced, the advance being two points for black and three points for galvanized pipe. Boiler tubes, both seamless and lapwelded, have advanced 10 per cent., while cold rolled steel shafting is now nett list at warehouse, as against 10 per cent. off formerly. The ingot metal market is very strong, copper, tin and spelter having advanced. The list of discounts on carbon drills and reamers has been revised, the change affecting reamers principally. New prices for cotton and wool waste have been issued. Prices of rope are also higher, due to abnormal conditions in the fibre markets. Prices of lead sheets are higher, while solders have also advanced on account of the tin market being stronger.

Steel Market

The situation in the steel trade is unchanged, the market being very strong, with prices still advancing. Conditions in the trade are abnormal, and it is impossible to say what level prices will eventually reach. The most serious feature is the possibility of a steel famine, as indications certainly point to one, especially if the consumption continues to increase at the present rate. Quotations on steel products are practically nominal, depending upon delivery and tonnage. The upward tendency of prices in the United States is affecting this market, and higher prices have been announced on a number of steel products, following advances in the States.

Boiler tubes, both seamless and lapwelded, have advanced 10 per cent. Mills have their output sold up for three or four months, and are behind on deliveries. Discounts on black and galvanized pipe have been lowered two points for the former and three points for the latter. Scarcity of steel and higher prices for kelp are the reasons for this advance. Cold-rolled steel shafting has again advanced, warehouse prices being now net list, while mill prices carry a discount of 10 per cent. The mills are sold out for from five to six months. Specifications are very heavy and consumers are only getting about half of the shafting called for in

their contracts. Prices of steel bars are very firm at $2.75, and deliveries are very backward.

Conditions in the galvanized sheet trade do not improve, and the market is very strong. Some of the mills in the States have withdrawn prices, their action being attributed to the further advance in spelter. Black sheets are also higher, and are becoming more difficult to obtain on account of the heavy demand. Prices of galvanized sheets are very firm, and an advance may be looked for in the near future.

The output of the United States Steel Corporation is sold up until the end of this year, unfilled orders now aggregating over eight million tons. The market has every appearance of developing in the second and third quarter a more serious shortage in supply of finished products than now exists, as it will be impossible for mills to increase their output, since they are now running to full capacity. There is no lessening in the demand for steel bars for munitions, both for domestic and export consumption. Prices for large rounds are very strong, 3.50c to 4.00c at mill being quoted for this material for last-half delivery. Prices on steel products continue in an upward direction, the advances this week including black and galvanized pipe, $2; wire rods, $5; shafting, $5 per ton; spikes, bolts and rivets, $2 per ton. Wire rods are now quoted at $50 per ton, Pittsburgh. Chicago warehouse prices for finished steel products have advanced $2 per ton, bringing steel bars and shapes to $2.60, and plates to $2.80. Steel bars are quoted at 2.25c, plates 2.50c, and shapes 2.00c, Pittsburgh. There is a great scarcity of billets, and the situation for semi-finished steel products promises to be more acute for the second half of the year than at present. The shortage of ferro-manganese is very serious, and quotations as a result are much higher. Prices on 80 per cent. ferro-manganese range all the way from $225 to $250 per ton seaboard for prompt shipment.

Pig Iron

There is no change in the pig iron situation, and quotations are at the same level as last week. Grey forge Pittsburgh iron is unchanged, as is also Lake Superior charcoal iron, the latter with an unusually wide spread of quotations. Hamilton and Victoria irons are unchanged.

Old Materials

The market is steady, with higher prices for copper, lead and zinc, which have moved up in sympathy with the ingot metal market. The scarcity of aluminum has increased the value of scrap metal, and prices have again advanced. Dealers have so far been unable to get a reduced freight rate on shipments of scrap from Western points.

Machine Tools

The machine tool market is quieter, and inquiries have fallen off. Canadian machine tool builders are very active, and have sufficient orders on their books to keep them busy for some time. Deliveries from American builders are still very backward, as many of these concerns are sold up for several months. Standard tools are particularly difficult to obtain, and deliveries run well towards the end of the year. The demand is almost entirely for machinery for munitions, normal requirements being very light.

Supplies

The market is steady, and dealers report very fair business. Prices on all supplies continue very firm, and are higher in some lines. Higher prices for cotton and wool waste have been issued, the advance being ¼c to 1c, according to grade. The increase in cost of raw materials is the cause of this, and another advance is expected in the near future. Manila rope has advanced 1c per pound, and the market is very strong. The record prices for rope which now prevail are due to extraordinary conditions in the fibre market. There is a great scarcity of Manila, and stocks in the hands of importers are very light, while the shortage of tonnage is seriously affecting the situation. Gasoline and benzine are unchanged, but higher prices are expected any time, as there is no improvement in the crude oil situation, and the demand for gasoline is steadily increasing. Prices of petroleum fuel oil will be higher on account of the duty which has been placed on imported oil, but lubricating and illuminating oils will not be affected. A revised list of carbon drills and reamers is included this week in the selected market quotations. The drills are practically unchanged, but the discounts on reamers have been lowered in some cases.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

Metals

The metal markets continue strong and prices are still moving upward for copper, tin, lead and spelter. The copper situation continues abnormal and the trade is asking where the present movement will lead to. The persistent advance in copper is the most prominent feature in metal circles just now, and the comparative scarcity of supplies will tend to force the market still higher. The tin market is quiet but a considerable volume of business has been transacted and prices are higher. Spelter is also moving up gradually, following higher quotations in London for both prompts and futures. The lead market is strong following the advance by the "Trust" to 6.30c New York and quotations are also higher locally. The antimony market is active and well sold up on spot and nearby futures. The supplies of aluminum are very scarce and the market is very firm. Solders have advanced following the increase in cost of tin.

Copper.—The remarkable situation in the copper market continues and the prices are still advancing. Copper producers are steadily selling their output farther ahead and spot metal is practically unobtainable. The consumption of copper is very heavy and is increasing rather than otherwise while indications point to still higher prices. Copper has advanced ½c locally and now quoted at 30½c per pound.

Tin.—The demand for tin has improved and quotations higher. The market is quiet but firm and indications point to higher prices as the position of this metal is a good one. It is reported that considerable quantities of tin have been purchased in the East at comparatively high prices principally for American account, which may also have a tendency to raise prices. Tin has advanced 1c and is quoted locally at 47c per pound.

Spelter.—The market is strong and higher following an advance in London. There is an improved demand for spelter and the market appears to be entering on another buying movement. Spelter has advanced 1c and is now quoted at 24c per pound.

Lead.—The market is very strong, the "Trust" having advanced their price to 6.30c New York. This price is abnormal but another advance would not be a surprise as Independents are well sold up and the market is in the hands of the "Trust". Local quotations are higher at 8¼c, being an advance of ¼c per pound.

Antimony.—The market is active and well sold up for spot and nearby futures. Prices remain unchanged on early deliveries at 47c per pound.

Aluminum.—The market is strong and unchanged but higher quotations are probable owing to the great scarcity of aluminum. Quotations are unchanged at 60c per pound.

Solder.—Prices have advanced as was anticipated owing to the increase in cost of tin. Half-and-half is now quoted at 25c per pound.

$16,000,000 FUSE ORDER PLACED

THE International Arms & Fuse Co., one of the recently organized "war order" corporations, with an extensive plant located at Bloomfield, N.J., has secured a contract through J. P. Morgan & Co., as agents for the British Government, calling for the manufacture of an unknown quantity of time and contact fuses. The aggregate value of the contract which has been closed by the company is approximately $16,000,000.

This order is in addition to the large order for time fuses obtained early in 1915 by the company from the Shell Committee of the Canadian Government, the filling of which has already progressed to a considerable extent. The new contract has been made so as to provide fuses needed for shrapnel and high explosive shells, contracts for which have been in course of fulfillment by various American and Canadian manufacturing companies for the past ten months.

Under the terms of the contract closed with the agents of the British Government, the International Arms & Fuse Co. is to receive an advance from the local banking agencies for Great Britain amounting to $750,000, for which surety bonds are still to be furnished. No performance bond is being required from the company, as the concern has already demonstrated its ability to carry out satisfactorily such manufacturing operations as may be required in filling the present order.

NEW CANADIAN ATLAS

THE new Atlas of Canada just issued by the Department of the Interior, of which Hon. J. W. Roche is head and W. W. Cory, C.M.G., deputy minister, is one of the most complete compilations of information about the country that could be prepared. The series of maps of the Dominion and provinces are beautiful examples of the cartographers' art. There are maps showing the geological formation, mineral deposits and forest distribution of the whole country. Another series shows the annual rainfall and climatic conditions of various sections at a glance. The canal, telegraph and railway systems are depicted in graphic form in others.

An interesting series of maps shows by colors the origins of the people, while the mixed settlement of the Western provinces is made vivid. Density of population is also shown by colors. The exploration of the country from the earliest discoveries is shown by means of maps also. In addition to the maps there is a very complete series of figures and diagrams illustrating the progress of trade and commerce, agriculture, manufactures, the growth of the Canadian mercantile marine, finance, fisheries and the whole economic activity of the country.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

Many figures are given as to population, education, vital statistics and maps of all the cities in Canada are an added useful feature. The whole Atlas is admirably arranged and indexed. It was prepared under the direction of J. E. Chalifour, chief geographer.

THE LONDON COPPER MARKET

THE "STANDARD" London England in an issue of recent date states that: the most prominent feature in metal circles just now is the persistent advance in the price of copper and the comparative scarcity of supplies. In London there is practically no refined metal obtainable for early delivery, while in New York the value of electrolytic has nearly reached the level touched during the boom that was in evidence in 1907, when as much as 26 cents per pound was conceded.

In the standard market here recently less than 2000 tons changed hands, but the undertone was decidedly bullish, and with the visible supply showing a further decrease of 585 tons, rates were put higher, cash closing at £89 and three months at £88 12s. 6d., representing gains of £4 15s. and £3 12s. 6d. respectively for the week.

Electrolytic advanced very sharply on scarcity to £120, which is fully £6 higher than the quotation registered a few days previously. The advance has since been continued, and sentiment at the moment is decidedly against any check on the upward movement in view of the strong cables from Transatlantic sources and the reserve of sellers.

In New York where the key of the position is to be found, the copper market has been extremely firm and excited, and present indications go a long way to confirm the view that the corner in the supplies of the red metal there, that was prognosticated for the end of January, has very nearly materialised. Spot metal is practically unobtainable, while the quotation for delivery three or four months ahead is as high as 25½ cents, and more or less nominal at that.

At this time last year the selling price of the same description was just over 14 cents, so that the value has appreciated no less than 80 per cent. during the twelve months. Considering that the total United States output of copper last year was 735,000 tons, this is a surprising state of affairs, and affords striking evidence of the extraordinary demand for the metal.

The purchase by the British Government last December has stimulated American consumptive buying. Munition makers on this side are covered by the Government offer to supply them at £100 per ton, but in the open market there is very little best selected or electrolytic to be had, and the high freights now ruling, coupled with the abnormal shortage of steamer space, preclude any alleviation of the position for some time to come. In any case, with American consumers extremely anxious to cover their future needs and the leading New York agencies sold out for several months to come, there is no denying the fact that producers have the market under perfect control, and the long-expected corner looks like eventuating in accordance with predictions.

As the large Government purchase was made at about 20 cents per pound it is a matter for congratulation that so much foresight was shown over the transaction. Of course, a great deal now depends on the future requirements

for munition purposes, which constitute the greater part of the present abnormal demand; but taking into consideration the financial ease in America, and the fact that the output has reached such a height that it cannot be raised further for some months to come, there does not appear to be any prospect of present conditions changing in favour of consumers in the near future.

Personal

G. S. Kilbourn, of Calgary, Alta., has accepted the position of managing director of the Canadian Malleable Iron Co., Owen Sound, Ont.

Arthur P. Scott, well-known in engineering circles in Montreal, died in that city on Feb. 17, aged 39. Mr. Scott was a graduate of McGill University and for the past year had been connected with the Snider Electric Co., of Chicago, Ill.

A. J. Latornell, B.A.Sc., has resigned his position as city engineer of Edmonton, Alta., in order to enlist for overseas service.

M. C. Rose has been appointed Publicity Agent for the town of Oshawa, Ont. A campaign will be conducted to secure new industries for this town.

J. W. McCallum, for many years superintendent of the Amherst branch of the Canadian Car & Foundry Co., died at Amherst, N.S., on Feb. 16.

Andrew J. Davies has been elected a director of the Northern Electric Co., Montreal, to fill the vacancy caused by the death of Robert Archer.

Miller Sutherland, foreman of the pipe shop at the Vancouver Engineering Works, Vancouver, B.C., has joined the 6th Canadian Field Engineers for overseas service.

Harry Cockshutt, president and managing director of the Cockshutt Plow Co., Brantford, Ont., has been made Lieut.-Col. in the active militia and will command the 215th battalion.

Capt. Alex. Lewis, of the Queen's Own Rifles, late secretary of the Toronto Harbor Commission, will be second in command of the new "Bantam" battalion recently authorized.

Duncan Coulson, president of the Bank of Toronto, died on Feb. 19, at Toronto, Ont., following a long illness. The deceased was born at Toronto in 1838 and had been connected with the bank since 1858, being elected president in 1911.

T. A. Trenholme, of Montreal, has been elected a director of the Cedars Rapids Manufacturing and Power Co. Mr. Trenholme has been a large holder of Montreal Power and Shawinigan securities for some years and took a large interest in the new Cedars enterprise when it was floated under the direction of the two older companies.

THE A. R. WILLIAMS MACHINERY CO., LTD.

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

Canada's Leading Machinery House

IMMEDIATE DELIVERY

Subject to Prior Sale

3—18 x 8 New Cisco Engine Lathes.
2—19 x 8 New LeBlond High Duty Lathes, Double-Friction Back Gears.
4—18" x 8' New Milwaukee Lathes with Turret on Carriage.
1—2 x 24 Jones & Lamson Bar Equipment.
1—No. 2 Warner & Swasey Turret Lathe, Geared Friction Head and Chasing Bar.
1—No. 3 Becker Vertical Milling Machine.
3—No. 14 Colburn High Duty Drills.
25—Good rebuilt 16-18-20-24" Engine Lathes.
15—Miscellaneous Screw Machines, 5/8 to 3" capacity.
No. 24 Landis Crank Grinder.
2—24" Gourd & Eberhardt Shapers.
1—18" Libby Turret Lathe.
1—Gridley Automatic.
2—2½' Fosdick Radial Drills.

Wire or 'Phone us for Quick Service.

MACHINE TOOL DEPARTMENT

THE A. R. WILLIAMS MACHINERY COMPANY, Limited

64-66 FRONT STREET WEST, TORONTO

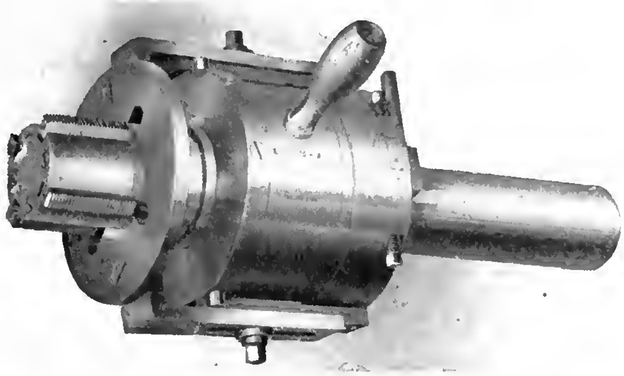
WHAT DOES IT COST

To back a Solid Tap out of the work every time a thread is cut? Consider the damage to the threads and the number of broken taps.

DO YOU KNOW ABOUT THE

Geometric Adjustable Collapsing Tap

that requires no backing off?



Geometric Collapsing Tap, Class "N-L," equipped with Chasers for Bottoming.

Applied to your Drill Press or Turret Lathe, it will do better work, in half the time, than solid taps.

GEOMETRIC COLLAPSING TAPS are as rigid as solid taps while cutting, but collapse their chasers automatically when the required depth has been tapped

Send for the Catalogue.

THE GEOMETRIC TOOL CO.

NEW HAVEN, CONN., U.S.A.

Canadian Agents:

Williams & Wilson, Ltd., Montreal

The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

London, Ont.—The Southern Ontario Gas Co. contemplate making considerable extensions to the distributing system.

New Toronto, Ont.—The Brown Brass Rolling Mill Co. will make an extension to their plant at a cost of about $25,000.

Hespeler, Ont.—The A. B. Jardine Co.'s plant, which was recently damaged by fire is being rebuilt.

Montreal, Que.—The Steel Company of Canada will build an addition to its plant here to cost $24,000.

Ingersoll, Ont.—Fire caused an explosion at the local gas plant, destroying a purifier, and doing about $4,000 damage. Mr. Montgomery is superintendent.

Toronto, Ont.—The National Equipment Company are building an extension to their factory estimated to cost $17,500.

Sault Ste. Marie, Ont.—It is reported that the Algoma Steel Co. will extend their plant by the addition of a building 350 feet long by 120 feet wide.

Cap Madeleine, Que.—The St. Maurice Paper Co., will build a large paper mill here. The Geo. A. Fuller Co., of Montreal, are the general contractors.

Stevensville, Ont.—John Pirson, is in the market for machinery for tight barrels, drum saw and a 36-in. stave joiner.

Toronto, Ont.—Witchall & Sons, Toronto, are receiving sub-tenders in connection with the power station which is to be erected near Orillia, Ont.

Sarnia, Ont.—The Imperial Oil Co. will erect an addition to the machine shop and ten new pressure stills will be built.

Montreal, Que.—It is reported that the Imperial Oil Co. will build a plant here for making road oils and paving materials.

Guelph, Ont.—Alex. Callander, formerly with the Taylor-Forbes Co., proposes to erect a foundry here for making light castings. The plans are prepared and work will begin shortly.

The Imperial Oil Co. are purchasing through the Sarnia, Ont., office all the steel work, machinery, pumps and boilers, etc., for the proposed refinery at Regina, Sask.

Calgary, Alta.—The Ford Motor Co., will build an assembling plant here, to cost $200,000. It has secured a site at Eighth Street West and Eleventh Avenue. The initial building will be 130 x 200 ft., four stories.

Moncton, N.B.—Fire on Feb. 20 destroyed the main building of the Record Foundry & Machine Co. The loss on the building and plant is estimated at $100,000, which is covered by insurance. In the part of the plant destroyed were the sales and shipping rooms, fitting and nickel finishing departments.

Municipal

Peterborough, Ont.—The city council are considering the installation of a sewage disposal plant.

Weyburn, Sask. — The city council contemplate increasing the capacity of the civic power plant. It is proposed to raise $35,000 for this purpose.

South Vancouver, B.C. — The city council are considering buying additional equipment for the fire department and building fire stations.

Sarnia, Ont.—Negotiations are in progress with a large linen company which may be induced to build a plant in this city for the purpose of taking care of the Canadian trade.

Sarnia, Ont.—The city is carrying on negotiations with a number of concerns which are considering building branch plants in Canada and it is likely that

EQUIPMENT FOR AUSTRALIAN NAVAL DOCKYARD

Tender forms and specifications have been forwarded by D. H. Ross, Trade Commissioner, Melbourne, for 43 machines of various types required for the equipment of the Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W. Tenders will be received, subject to the conditions specified, up to May 1, 1916, addressed to the Director of Navy Contracts, Melbourne, Australia. The last mail in time to reach Melbourne on May 1 is that leaving San Francisco on March 22 and due at Melbourne on April 12. The tender forms are open to the inspection of Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer file No. A-1435). Particulars of the requirements are briefly outlined thus:

Three 50-ton overhead travelling cranes.

One 25-ton overhead travelling crane.

Two 5-ton overhead travelling cranes.

One 10-ton revolving cantilever crane.

Two 5-ton travelling portal jib cranes.

Two 7½-ton jib cranes.

One 5-ton jib crane.

Two 15-ton hydraulic cranes.

One 6-ton hydraulic crane.

One 6-ton wall crane (hydraulic).

Two 3-ton wall cranes (hydraulic).

Two electric passenger elevators.

Two electric goods elevators.

One 2½-ton gauge locomotive with crane attached.

One 2½-ton gauge locomotive without crane attached.

Three electrically-driven air compressors, 1,500 cu. ft.

One 15-ton hydraulic winch.

One 5-ton hydraulic winch.

Nine 10-ton hydraulic capstans.

Two 5-ton hydraulic capstans.

One bar shearing machine.

One double-ended horizontal punching machine.

One 10-ton overhead travelling crane for shipyard fitting shop.

Nobility in Overalls

Lord Norbury "ringing in" on an "International"

In these stirring times many remarkable incidents are being recorded. The illustration shows Lord Norbury, one of England's wealthiest noblemen, going to his job as fitter in an aeroplane factory in overalls, "ringing in" on an

International Time Recorder

The International Time Recorders play no favorites—lords or laborers, it gives the same automatic record—accurate, indisputable — made by the employee himself.

The International is the choice in the great factories of the world for checking the cost of labor, saving money. It will do the same for you.

There is an International Time Recorder and System that exactly fits your business, no matter how peculiar your requirements may be—ready to guard every minute of the time you pay for.

The International will soon discharge its debt and bring you in profitable returns from the time saved and the efficient service given.

WRITE US FOR FULL PARTICULARS.
The prices range from $95.00 up.

International Time Recording Co. of Canada, Limited

Ryrie Bldg., Corner Shuter and Yonge Sts., TORONTO

F. E. MUTTON,
General Manager

Montreal Representative: W. A. WOOD, Jr.
Sales Agent, Cor. McGill and Notre Dame Sts., Montreal

some of these at least will be secured for Sarnia.

St. Mary's, Ont.—The Council contemplates the erection of an auxiliary pumping plant to cost $8,000. Gasoline engines may be used. Thomas M. Clark is clerk.

Wellesley, Ont. — The Town Council will call tenders in about two months for the erection of an electric distribution plant to cost $7,500. The town clerk is P. F. Schummer, St. Clements P. O., Ont.

Electrical

Mount Elgin, Ont. — The Durham Township Council contemplate installing an electric light system.

Dashwood, Ont.—The people of the police village of Dashwood voted on Feb. 15, in favor of Hydro-electric power. It is understood that the line will be built from Exeter West to Dashwood, with branches from Sarepta north to Zurich and south to Crediton.

General Industrial

Toronto, Ont.—J. A. Scythes & Co., will build an extension to their factory on Paton road.

Coaticook, Que.—The Warrior Fabric Co. are considering making an extension to their factory here.

Oshawa, Ont.—The Bryant Manufacturing Co. will probably establish a factory here.

Toronto, Ont.—E. F. Brown representing the Fardrew Peet Mfg. Co., of Boston, Mass., has been here looking for a suitable location for a clothing factory.

Toronto, Ont.—The Gutta Percha & Rubber Co., will at once erect an addition to its factory on West Lodge Avenue.

Bridgeburgh, Ont.—Edwards & Edwards, Toronto, Ont., have leased a building at this place, and will equip it for the manufacture of leather goods of all kinds.

Edmonton, Alta.—The Emery Co., whose plant was recently destroyed by fire will resume operations as soon as suitable premises can be secured and the necessary machinery installed.

Saskatoon, Sask.—A concern known as the Sand & Gravel Deposits Ltd., has been incorporated with the object of making concrete chimneys, fence posts, window sills, etc. E. E. McEown is interested in the proposition.

Toronto, Ont.—As the new registry office is nearing completion, it will be necessary to equip same with steel filing apparatus and other metal furniture, as well as the provision of electric lighting fixtures. The approximate cost of this work will be $60,000.

Tenders

Ottawa, Ont.—Tenders will be received until Feb. 29, for the supply of waterworks materials for this year. Particulars can be obtained from R. L. Haycock, waterworks engineer.

Montreal, Que.—The Board of Control have decided to call for new tenders for a supply of 6,000 tons of asphalt, replacing the former call, which was illegal, due to a mistake in the preparation of the advertisement. Tenders close of March 2.

Toronto, Ont.—Tenders will be received up to Tuesday, March 7th, 1916, for furnishing and constructing radial brick chimney and foundations for the refuse incinerating plant on Don Roadway. Specifications and forms of tender may be obtaned from the office of the Street Commissioner, City Hall.

Toronto, Ont.—Tenders addressed to the Secretary-Treasurer, Board of Education, will be received until Wednesday, March 8, 1916, for science class electrical equipment for Humberside Collegiate Science Department. Specifications may be seen and all information obtained at the office of the Clerk of Supplies, City Hall.

Ottawa, Ont.—Tenders will be received up to March 1, 1916, for:—1. The construction of a pumping station and electric sub-station on Lemieux Island, of the City of Ottawa. 2. The manufacture, delivery and installation of:—(a) Main piping, valves and specials. (b) Heating and plumbing. All for the above stations. Plans and specifications may be seen at the office of the engineer, John B. McRae, 310 Booth Bldg., Ottawa.

Toronto, Ont.—Tenders will be received by the chairman, Board of Control, City Hall, up to Tuesday, March 14, 1916, for the supply and delivery of: One single-truck, double-end street car, completely equipped; one car body, double-end, single-truck; equipment for one single-truck; equipment for one single-truck car. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Collingwood, Ont.—Tenders will be received by the chairman of the Collingwood Water & Light Commission until Wednesday, March 1, 1916, for the following works:—(1) Steel water tower. (2) Foundation for steel water tower. (3) Pumping machinery, comprising one motor-driven unit of 800 Imperial gallons capacity. (4) Pump well and connections. Plans and specifications may be seen at the office of the Engineers Chipman and Powers, 204 Mail Building, Toronto, or at the Water and Light Office, Collingwood.

Ottawa, Ont.—Tenders will be received until Monday, February 28, 1916, for the construction of timber lock gates and their equipment for the East River Lock, near New Glasgow, Pictou County, N.S. Plans and forms of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the district engineers at Antigonish, N.S.; Halifax, N.S.; Shaughnessy Building, Montreal, P.Q.; Confederation Life Building, Toronto, Ont., and on application to the postmaster at New Glasgow, Nova Scotia.

Hamilton, Ont.—Tenders will be received up to Wednesday, March 1, 1916, for supplying the corporation of the City of Hamilton. with the following:—Castings (ordinary and special), iron pipe, hydrants, valves, extension boxes, lead pipe, pig lead, rubber hose, rubber boots, road oil, lubricating oil, flux, fuel oil, coal oil, gasoline, concrete and garbage duck covers, bass brooms, sectional sweepers, brass work, including ordinary and special brass castings for water department. hardware. Specifications and form of tender for all of the above can be obtained at the office of the city engineer, Hamilton, Ont.

Building Notes

Swift Current, Sask.—The Imperial Oil Co. propose building a warehouse and storage tanks here.

Owen Sound, Ont.—In the estimates for the fiscal year, $25,000 is included for a drill hall here.

Sarnia, Ont.—The H. Mueller Mfg. Co., will erect an office building 60 ft. by 60 ft. and 3 stories high.

Toronto, Ont.—J. A. Scythes and Co., have secured a permit to add an extra storey to their factory on Brown's Ave. to cost $3,500.

Swift Current, Sask.—The contract for converting the old Central school into a town hall has been let to the local contracting firm of More & McWilliams at $2,963.

Toronto, Ont.—Tenders have been received for rebuilding the Princess Theatre. The work is estimated to cost about $200,000. Mr. Crane of Detroit, Mich. is the architect.

Toronto, Ont.—The city architect has granted a permit to the Martin Corrugated Paper Box Co., for the erection of a one-storey brick factory at 353 Pape avenue. It will cost $16,000.

Toronto, Ont. — The Laura Secord Candy Co., have been granted a permit for the erection of a four-storey, brick building for use as a factory at 64 Princess street. The estimated cost is $9,000.

Toronto, Ont.—The Management Committee of the Board of Education at a special meeting decided to recommend the expenditure of more than $595,600 in providing a new collegiate school and making necessary additions to several public schools.

Toronto, Ont.—The city architect has approved of plans presented by the Canadian Bank of Commerce for alterations at their premises, 27-29-31 King street west. According to the plans the new building will consist of four storeys, brick and stone. It will be sixty feet high and is estimated to cost $10,000.

Wood-Working

Montreal, Que.—P. E. Bourassa & Son will make extensions to their woodworking plant.

Stratford, Ont.—The George McLagan Furniture Co. will erect this year a four-storey addition to their present plant. The addition will have a depth of 160 feet, and will be about 60 feet wide.

Railways—Bridges

Edmonton, Alta. — Plans are being prepared for a big steel bridge over the Peace River Crossing. The total cost will be about $750,000.

Toronto, Ont.—The application of the Toronto, Barrie and Orilla Railway to be allowed to proceed with the construction of its proposed line of railway was heard by the Cabinet Council on Feb. 17.

Hamilton, Ont.—Plans for the bridge over the Valley Inn., to be used in connection with the entrance of the Toronto-Hamilton highway to the city will shortly be considered by the Board of Control. It is estimated that the bridge will cost $250,000.

Edmonton, Alta.—An all-steel bridge containing 650 tons of steel is to be constructed over the Heart river, a short distance south east of Peace River Crossing, for the E. D. and B. C. road. The Dominion Bridge Co., which has the contract, already has the steel fabricated. The bridge is to be 600 feet long.

Refrigeration

Hamilton, Ont.—The Board of Health have passed a resolution favoring the establishment of a municipal abattoir, which, it was thought, would insure a proper inspection and handling of the meat supply of the city.

Trail, B.C.—Tyson Bros., proprietors of the City Meat Market, are having their new market equipped with a 5-ton refrigerating plant and small ice-making system, furnished by the Armstrong Machinery Co., Spokane, Wash.

St. John's, Nfld.—It is proposed to organize a concern which will be known as the American-Newfoundland Packing Co., with J. W. Clouston as general manager and E. St. John Howley as vice-president and managing director. A big cold storage plant in connection with the St. John's house will be operated at Bay Bulls, and several other stations will be erected around the coast.

Trade Gossip

Carter Welding Co, Toronto, have recently been appointed sales agents for oxygen made by Lever Bros., Toronto.

The John Galt Engineering Co., of Winnipeg and Calgary will in future be known as Haddin & Miles Ltd.

The Pollard Manufacturing Co., has been authorized to increase the capital stock of the concern to $150,000.

Sherbrooke, Que.—The city council have awarded the contract for the supply of transformers to the Canadian General Electric Co., Montreal.

The Canadian General Electric Co., Toronto have been awarded a contract for two transformers by the St. Thomas Hydro-Electric Commission.

London, Ont. — A number of local business men in conjunction with the Board of Trade propose securing a factory site in order to attract new industrials to the city.

William R. Perrin, Ltd., Toronto, have designed and are superintending the installation of a 1,000 ton hydraulic forging press for the Dominion Steel Foundries Ltd., Hamilton, Ont.

The Eugene Dietzgen Co., dealers in engineering and scientific instruments and supplies, have moved their head Canadian office from 116 Adelaide St., West, to 31 Richmond Street West, Toronto.

The Saxon Motor Co. of Detroit, Mich., will open up a Canadian branch at Windsor, Ont., with K. W. Macrae as manager. A factory will not be erected at present, but it is expected that an assembly plant will be established later.

Fort William, Ont.—The annual meeting of the Board of Trade was held recently and the following officers were elected for 1916: President, W. L. Bird; vice-president, W. K. O'Donnell; secretary-treasurer, W. Webster.

The St. Helen's Cable & Rubber Co., of Warrington, Lancs, Eng., manufacturers of the St. Helen's patent cab tyre, sheathed cable, etc., are now entering the Canadian market. The Canadian business will be conducted through the agency of J. D. Lachapelle & Co., 317 St. James street, Montreal, Que.

Bureau of Commercial Export Intelligence.—Canada is to have a branch of the Trade and Commerce Department to foster the manufacture of new lines of export goods. It will be known as the Bureau of Commercial Export Intelligence. The plan will embrace a section of imported articles that could be made in Canada, and their display at a central point with all information that can be secured to enable manufacturers to determine whether they could take up these lines for competition with other countries.

Receipts at Trial, B.C.—The Consolidated Mining & Smelting Co. of Canada, ore receipts at Trial Smelter for the week ending February 10, 1916, and from October 1st, 1915, to date, were in tons as follows:—

	Week	Year
Centre Star	2,635	61,187
Le Roi	2,353	48,177
Sullivan	1,550	17,153
No. One	151	1,768
St. Eugene	....	182
Silver King	....	15
Other mines	1,350	29,173
Total Tons	8,039	157,755

St. Catharines, Ont.—The N. St. C. & T. Electric Railway have asked Parliament to extend the time allotted for finishing its railway from Fort Erie to Niagara-on-the-Lake; from St. Catharines to Hamilton and Toronto, and from Port Colborne to Fort Erie, but is partly to allow the N. St. C. & T. R. time to purchase the Michigan Central line from Fort Erie to Niagara-on-the-Lake. This sale is pending, and when it is consummated and the N. St. C. & T. Company's proposed line from Port Colborne to Fort Erie is built it will give the N. St. C. & T. Railway a circuit right around the Niagara peninsula.

Contracts Awarded

Ottawa, Ont.—The City Council have awarded a contract for two pumps to Mussens Ltd., Montreal, Que.

Winnipeg, Man.—The Winnipeg Construction Co., have awarded a contract

for centrifugal pumps to the London Concrete Machinery Co., London, Ont.

The National Iron Works, Ltd., Toronto, Ont., have been awarded a contract by the City of Ottawa for the supply of a large quantity 18-in., 20-in., 24-in, 30-in. and 36-in. cast iron waterpipe, aggregating about 4,000 tons.

Personal

John Collins has been appointed general manager of the Canadian Steam Boiler Equipment Co., Toronto, manufacturers of the "Cyclone" shaking and dumping grate bar. Mr. Collins was formerly supervising engineer with Gillespie Bros., Toronto.

Hon. Wm. M. Hughes, Premier of Australia, arrived in Ottawa last Thursday and will be a guest at the Government House. The party was met at Central Station by Major-General Sir Sam Hughes and a guard of honor from the 77th battalion.

J. Harry Smith, for many years Montreal representative of the Chapman Double Ball Bearing Co., Toronto, Ont., died in hospital at Saint John, N.B., from acute appendicitis, on Feb. 6th. Mr. Smith was widely known in the Eastern provinces, and to many of his numerous business friends his death at the age of 51 came as an unexpected shock.

New Incorporations

The Chicago Roche Deboule Copper Co., has been incorporated with a capital of $100,000,000.

The Excelsior Machine Co., Ltd., Saskatoon, Sask., has been incorporated with a capital stock of $10,000 to manufacture machinery, tools, etc.

The Steel Foundry of Quebec, Ltd, Quebec., has been incorporated with a capital stock of $49,000 by J. A. Larue, E. Massicotte, E. Trudel, and others, to manufacture machinery, iron, steel, etc.

H. Muehlstein & Co., Montreal, have been incorporated with a capital stock of $10,000, by Joseph A. Perodeau, Francis E. McKenna, Paul S. Conroy, and others to manufacture rubber, tires, etc.

La Fonderie d'Acier de Quebec, Ltd., has been incorporated, with a capital of $149,000, to carry on a foundry and engineering business at Quebec. The incorporators are J. A. Larne, E. Trudel and W. Boulet, all of Quebec.

The Aeroplane Products, Ltd., has been incorporated at Toronto with a capital of $40,000 to manufacture, aeroplanes, and flying machines, etc. Head office at Toronto. Incorporators: A. Mearns, E. G. Long and J. E. Belfrey all of Toronto

The Sudbury Nickel Co., has been incorporated at Toronto with a capital of $100,000 to develop mineral lands and refine copper and other minerals. Head Office at Sudbury, Ont. Incorporators, T. E. Smith, W. N. Smith and R. T. Smith, all of Sudbury.

The Boston Creek Mining Co., has been incorporated at Toronto with a capital of $2,000,000 to acquire and develop mines and mineral lands. Head Office at Toronto. Incorporators, P. W. Cashman, A. Gillies and J. C. Thompson, all of Toronto.

The Thomson-Gordon Co., has been incorporated at Toronto with a capital of $40,000 to manufacture engine packings and mill supplies. Head office at Hamilton. Incorporators, G. J. Thomson, E. Gordon and W. C. Thomson, all of Hamilton, Ont.

The Multisize Rotary Press Co., has been incorporated at Ottawa with a capital of $150,000 to manufacture all kinds of machinery and printing presses, etc. at Toronto, Ont. Incorporators, G. M. Willoughby, J. M. Bullen and H. L. Steele all of Toronto.

The London Gas Power Co., has been incorporated at Ottawa with a capital of $100,000 to carry on the business of iron and brass founders, steel makers, etc. Head office at London. Incorporators, W. H. Heard, J. W. G. Winnett and C. A. Bowman, all of London, Ont.

The Excelsior Charcoal Co., has been incorporated at Ottawa with a capital of $100,000 to manufacture charcoal and other products. Head office at Montreal.. Incorporators, Arther Lalande, Hector Lalande and A. Lalande all of Montreal.

The Waterland Motor Co. has been incorporated at Ottawa, with a capital of $300,000, to manufacture automobiles, trucks, etc. The head office to be situated at Walkerville, Ont. Incorporators: William R. Woollatt, George Reid and Chauncey M. Bennett, all of Walkerville, Ont.

The Metropolitan Class Co., has been incorporated at Toronto with a capital of $40,000 to manufacture glass and mirrors of all kinds and building materials. Head Office at Toronto. Incorporators, J. B. Robertson, G. A. Robinson and G. D. McLeod, all of Toronto.

The Callander Foundry & Manufacturing Co., has been incorporated at Toronto with a capital of $40,000 to carry on a general foundry and machine shop business. Head Office at Guelph. Incorporators, J. M. Ferguson, J. P. Walsh and A. C. Rutherford, all of Toronto

The Saxon Sales Co., has been incorporated at Toronto with a capital of $40,000 to carry on the business of manufacturers of automobiles, motor cars, motor trucks; etc. Head office at Toronto. Incorporators G. F. Green, W. C. Omand and C. H. Peaker, all of Toronto.

The Canadian Consumers Casein Co., has been incorporated at Ottawa with a capital of $50,000 to manufacture casein and other supplies, necessary in the manufacture of paper or paper products. Head office at Toronto. Incorporators, J. M. Bullen, H. L. Steele and F. H. Hurley all of Toronto

The Guelph Carriage Top Co. has been incorporated at Ottawa with a capital of $50,000, to purchase from the Guelph Carriage Top Co. the business now carried on by the company at Guelph, Ont. The head office to be situated at Guelph, Ont. Incorporators: Charles L. Dunbar, Leo W. Goetz and John Sutherland, all of Guelph, Ont.

The Canadian Cartridge Co. has been incorporated at Toronto with a capital of $750,000, to manufacture copper, bronze, brass and steel products, hard-

ware, cartridges, shells, ammunition and other kinds of goods. The head office to be situated at Toronto. Incorporators: Wm. S. Morlock, E. G. Murphy and Bruce V. McCrimmon, all of Toronto, Ont.

Catalogues

The Roller-Smith Co., New York, have issued a leaflet showing an "oscillogram" of a Roller-Smith circuit breaker.

Cleaning Compounds.—A bulletin being distributed by The Munning-Loeb Co., Mattawan, N.J., describes No. 6 cleaning compound for the electro-plating trade. The principal features of this compound are described in detail and a comparison made with other materials used for the same purpose.

Book Review

Engineering as a Career.—Edited by F. H. Newell, Professor of Civil Engineering, University of Illinois, and C. E. Drayer, secretary Cleveland Engineering Society, 226 pages, 5 in. x 7 in., published by the D. Van Nostrand Co., New York, price $1.00 net. This book consists of a series of papers prepared by eminent engineers and presents for the guidance of young men and their advisers some of the facts usually hard to obtain concerning engineering as a life work. The choice of a vocation is as a rule a most difficult problem to solve for at the time when the decision has to be made, the boy or young man has little idea as to what will be required of him in his work. The same remark often applies to parents who cannot always judge what career the boys' qualifications are best suited for. The engineer who has written these articles endeavors to explain what he believes to be the personal and educational qualifications required, for success, and what opportunities await the young man who chooses engineering as a career.

The inspiration for the book came in response to numerous inquiries from high school teachers and others who are frequently called upon to advise young men in their choice and preparation for a professional life. It was found from experience that many youths who planned to study engineering had only the most hazy ideas of what is involved, nor were their teachers and parents much better informed. The book should prove of special value to professional advisers in vocational guidance work and to parents who have the opportunity of continued observation and intimate acquaintance from which may be learned the aptitudes of their sons.

Jo precede pp. 189

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, MARCH 2, 1916 No. 9

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President **H. T. HUNTER, Vice-president**

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY

PETER BAIN, M. E., Editor.

Associate Editors.

A. G. WEBSTER. J. M. WILSON. J. H. RODGERS.

B. G. NEWTON - - - - - - Advertising Manager

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 140 So. Dearborn St., Room 607, Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Press Tools Used in the Manufacture of Cherry Pitters

Staff Article

The elaborate nature of many tools seems in some cases to be in inverse proportion to their service purpose, and the production of simple household articles affords many examples of such. In this, as in many other spheres of manufacture, the economy of production is directly due to the skill of the designer and tool-makers in developing labor-saving devices.

IN the manufacture of many simple household articles, there are numerous interesting operations performed, which to the casual observer seem comparatively unimportant, but when investigated reveal the fact that many five and ten-cent articles now on the market are only obtainable at these figures because of the special equipment developed for rapid and cheap production. Such equipment easily runs into hundreds of dollars and frequently into thousands.

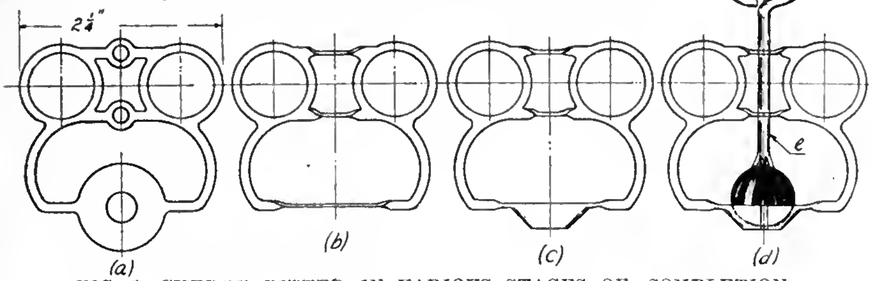


FIG. 1—CHERRY PITTER IN VARIOUS STAGES OF COMPLETION

The tools and methods described herewith are those used in the manufacture of a domestic cherry pitter, all of the operations being performed on single acting punch presses with the single exception of forming the eye on the ejector rod.

Selection of Material

One of the essential features in the manufacture of articles of this nature is the selection of material. Ribbon stock is preferable, as it permits a continuous feed in one direction, with a minimum expenditure of labor; greatly facilitating gauging operations. The metal should be homogeneous, of sufficient hardness to retain the desired shape after blanking, piercing and forming operations, and yet not so brittle as to tear in the twisting process, shown at (b) Fig. 1. In this figure is shown the cherry pitter in the various stages of completion; (a), the piece as it comes from the progressive die, Fig. 2; (b) as it looks after the twisting operation; (c) shows the shape of piece when it comes from the cupping die, Fig. 4; and (d) is a view after the cup has been notched in the die Fig. 5; (d) also gives an idea of the completed article after the ejector rod is in position.

Blanking and Piercing

The progressive or blanking and piercing die, is shown in Fig. 2; (a) being a cross section (lengthwise) of the punch and stripper; (b) is a plan of the die, and (c) is a section taken on the line x-y.

As shown in Fig. 2, the die is composed of four separate die blocks, dovetailed into the bed, and firmly held laterally by means of the wedge-shaped strips E, one on each end. The steel dies are further secured by the set-screws shown. The hole through which the pit of the cherry is ejected must be of a certain size after the cupping and notching operations, therefore when constructing the die, Fig. 2, it was necessary to complete the blocks A, B and D, leaving the piece C blank until the desired size had been determined.

The first step in the making of the progressive die is to ascertain the relative proportion of the die blocks. The feed of the stock will be the extreme width of the blank, shown at (a) Fig. 1, plus the allowance for scrap—in this case about 1/8 inch; therefore, the centres of the three stages of progression will be 2 3/8 inches. From the design of the article and position of the various holes, the two blocks A and D had a length of 3 1/4 inches, the centre pieces B and C a length of 1 1/2 inches; the three sections having a uniform

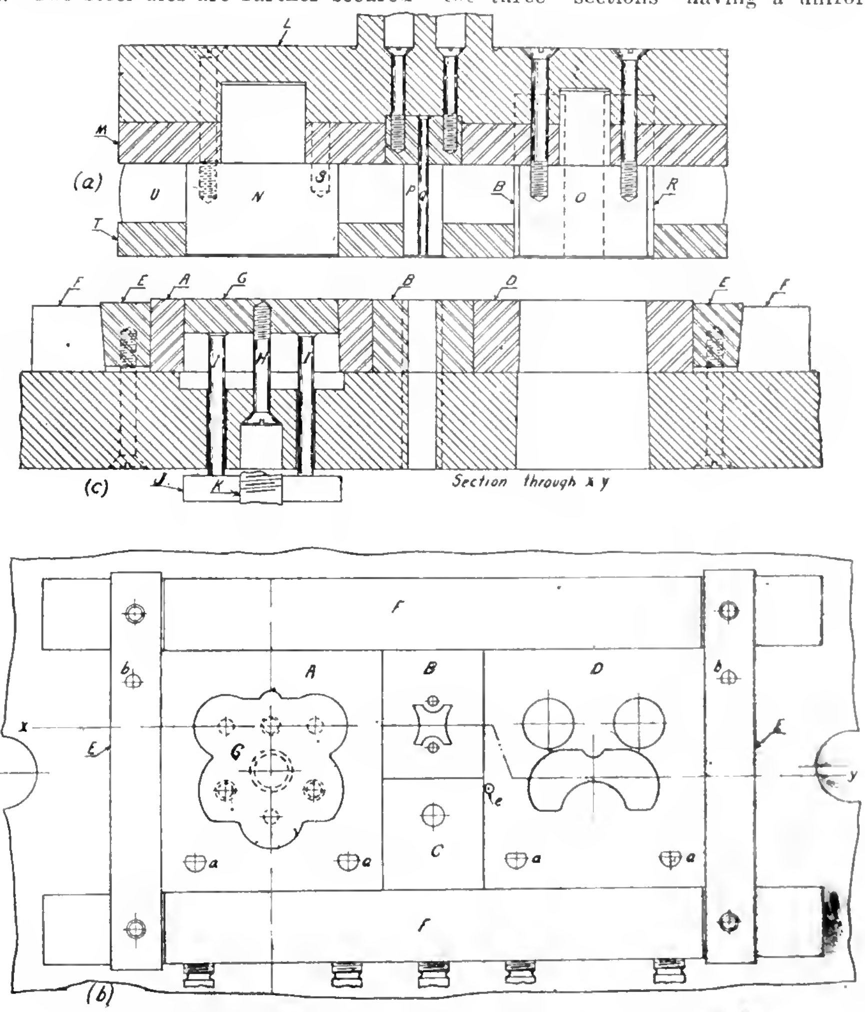


FIG. 2—PROGRESSIVE DIE FOR PUNCHING OUT FLAT SHAPE

width of 3 15-16 inches, with a side angle of 8 degrees. The blocks were made from 4-inch by 1⅛-inch cast steel. After the die blocks are in position, they are rigidly held together by means of the wedge strips E, one on each end.

To eliminate the possibility of distortion—which would arise if the finished piece was allowed to pass through the die A—it was decided to have the blank forced back into the strip after the cutting operation. This was performed by the ejector or knockout G, which, is kept flush with the cutting edge by means of the three screws H. The upward pressure on this plate is transmitted through the pins I, by the disc J, which is forced upward by a rubber cylinder (not shown).

The design of the punch is shown in section at (a) Fig. 2. Secured to the cast iron punch block L, is the punch pad M, which forms a support for the smaller punches. The large punches N and O, also the two round punches for the die D, have shanks which extend through the pad M and into the punch block L. In addition to this they are secured by means of the screws and dowels shown. The punch P was made from 1¼ inch round stock, shaped to the desired dimensions, with the base turned to fit the hole in the punch pad. The round base of the punch P formed a support for the two piercing punches Q. The stripper or pressure pad T is

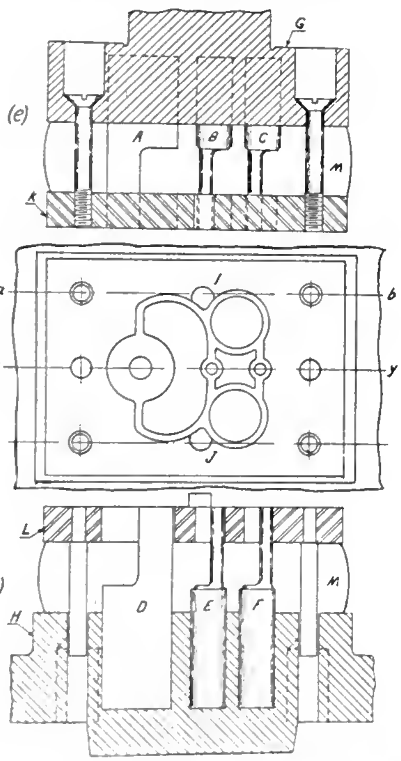


FIG. 3—FIXTURE FOR TWISTING RINGS

made to slide freely over the various punches while the pressure is derived from two strips of rubber running the full length of the stripper.

The stock which is in strips 2½ inches wide, is fed between the gauge pins (a) and (b) up against the pin (c); this pin gauges the progressive positions of the stock, as it comes in contact with

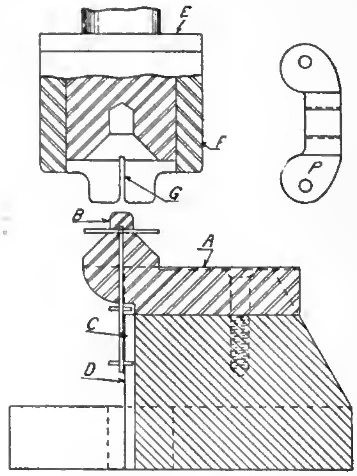


FIG. 4—CUPPING PUNCH AND DIE

the inner edge of the irregular-shaped hole punched in the first operation, or die D, Fig. 2. As it passes to the second position, the holes shown in dies B and C are punched, and when in the third position the blank is completely finished. At each succeeding stroke of the press one piece is completed as shown at (a) Fig. 1. During the operation the stock is held perfectly flat by means of the pressure plate T, and the blank is forced back into the ribbon, to be pressed out by the fingers after clearing the die.

Twisting the Centre Section

The next step is to twist the three centre rings to a position at right angles to the main portion. See (b) Fig. 1. This is done with a punch and die as shown in Fig. 3; (c) is a section through the die on the line xy, (d) is a plan of the die face, and (e) is a section through the punch on a line corresponding to a-b on the plan (d).

The punches, which are made of round stock are secured in the punch block G, and the die bed H. These punches are cut away as shown, so that when in position, a space equal to a little over the thickness of the stock is left between the vertical flat faces. The blank is held in the desired positions between the gauge pins I and J, and the pressure plates K and L, prevent the main portion from distortion while the center rings are being twisted to the desired angle of 90 degrees. Rubber M is also used in this die to retain the original shape of the article.

Cupping the Bowl

The piece is now ready for cupping the cherry bowl, as shown at (c) Fig. 1. A cross section of the punch and die used for this operation is shown in Fig. 4. P being a plan of the die bed used in both Figs. 4 and 5. Referring to Fig. 4, a dove-tailed groove is shaped in the top to receive the cast steel block A. This piece is further secured by means of the screw shown. On the outer end of this block is the forming post, B the pilot turned to fit the hole in the cherry pitter, and the cone portion made to suit the required shape of the cherry bowl. The lower front edge of the piece A is cut away, to allow the cherry pitter to swing into position. A groove C is shaped below the post to permit the cherry pitter to rest against the face D, which is half the thickness of the stock back of the centre line of the post B.

The punch E is bored out to fit the cone of the post B with a hole to receive the pilot pin. On the outer diameter of the punch E is the ring F, which is cut away at the front and back to clear the block A. The purpose of the narrow slot at G is to prevent the stock from buckling while the cup is being formed.

Notching the Bowl

The thickness of the punch required to notch the cone will be determined by the width of slot desired. Owing to the action of the twisting and cupping operation, a certain strain has been set up in the metal surrounding the cone, therefore allowance must be made for this when notching the bowl. When the proper thickness has been determined, the next step is the making of the notching die. This was constructed as shown in Fig. 5; a die bed similar to that used

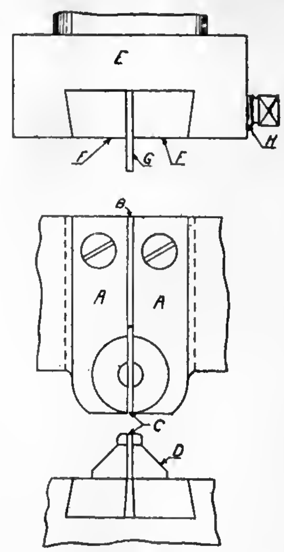
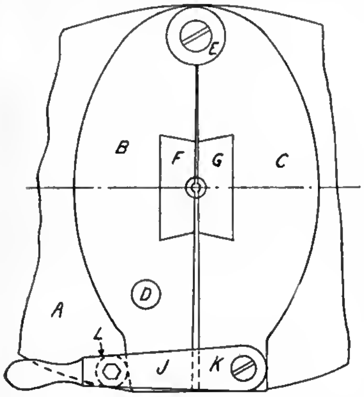


FIG. 5—NOTCHING PUNCH AND DIE

for Fig. 4 was shaped out to receive the two pieces A, A plus the piece B, which is the thickness of the punch required. This piece B is made of sheet cast steel and just long enough to leave the slot C, through which the punched stock can pass. This, like the cupping die is turned to fit the cone as produced from the preceding die, as shown at D.

The cast iron punch block E is shaped out to receive the pieces F, and the sheet steel punch G. Additional security is obtained by the set screw H. It will be found, after notching the cone, that the slot is a little wider than the die opening, due to the removal of the strain in the metal, caused by the two preceding operations. The object of this slot is to allow the cherry stems to be drawn through while the pit is being ejected.



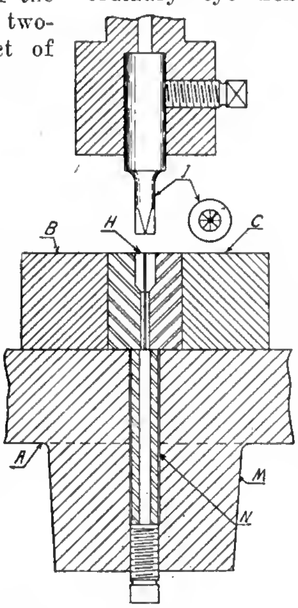


FIG. 6—PUNCH AND DIE FOR SPLITTING END OF EJECTOR ROD

Splitting the Ejector Rod End

The die used for splitting and spreading the ends of the ejector rod (e) Fig. 1, is shown in Fig. 6. Upon the top surface of the die bed A, are the two blocks B and C; B is doweled in position by the pin D, shown in plan view, and secured to the bed by the screw E. This screw also acts as a centre upon which the block C is swung to and fro, to permit the insertion and removal of the wire rod. The two dovetailed cast steel clamping pieces F and G, are firmly pressed into their respective blocks. With these two vise blocks held firmly together the centre hole is drilled a shade smaller than the diameter of the ejector rod (e) Fig. 1; this rod is made from No. 9 tinned wire. The counter bore shown at H was a free fit for the punch I, and of sufficient depth to give ample support to the punch before commencing to split the end of the wire. The clamping lever J is pivoted at K, and carries a roller L, which is forced over the eccentric arc, firmly clamping the wire between the vise jaws. On the lower surface of the die bed is the boss M, of sufficient depth to allow of a set screw being used for height adjustment of the wire. The tube N was inserted to aid in preventing the wire from buckling while being split.

The cast steel punch I is held in the punch holder by the set-screw shown; the end of the punch is filed to give four chisel edges of a fairly acute angle. An end view of the punch is also here shown.

When the ejectors have been spread on the end, they are placed in the pitter and the eye on the end is formed in an ordinary eye bending machine, with the forming block of the desired shape.

USE OF OXY-ACETYLENE WELDING IN WAR TIME

By C. R.

THE war has provoked a great development of the oxy-acetylene welding, and we are informed that this process has been a very great help in permitting the quick manufacturing of articles required by the army.

It is no secret that oxy-acetylene is used on a vast scale for the manufacture of bombs and also aerial torpedoes. But outside of these warfare engines, which are not very accurate, a new trench gun has been perfected a few months ago, which is accurate, and does immense damage to the enemy's trenches. The shells for these new guns are made by oxy-acetylene process, and could hardly be done by any other process. However, the application of welding for such manufacturing is very difficult, because the welds have to be afterwards machined on the lathe, must show a very high strength, special physical properties, and be absolutely non-porous.

It is claimed that to obtain such results it has been necessary to use new methods of working with special filling materials, and this new method has been evolved by the French Association of Autogenous Welding. It is kept a secret, and is only transmitted to the munition department of the allies.

General Requirements of the Armies

Outside of these new shells, and other bombs and projectiles made largely by oxy-acetylene process, there are many articles made by the same process, which are manufactured owing to the increased requirements of the army, such as cooking utensils, sterilizing apparatus, coffee roasters, rolling kitchen, reservoirs, tanks, washing machines, metal beds and tables, parts for power factory, shovels, aeroplane parts, sheet metal bodies for aeroplanes and automobiles, trucks, harness, hooks, metal piping, rings and hooks for drinking bottles, forging for artillery, etc.

Acetylene welding is also used largely for the repairing at the front of broken pieces of machinery, automobiles, trucks, and for the cutting of bridges and iron and steel parts.

All these works have greatly enhanced the demand for oxygen, and it is understood that in France, the oxygen factories are working at capacity, and, owing to the lack of oxygen cylinders, are hampered to supply the trade.

TRADE AFTER THE WAR

THE directors of the Glasgow Chamber of Commerce at a meeting held recently to consider the report of a committee on the question of trade after the war, passed, among others, the following resolutions:—

(1)—That his Majesty's Government be urged to take immediate steps for the establishment of a Department of Commerce and Industry and the appointment of a Minister of Commerce with cabinet rank, in order that the manufacturing and commercial interests of the British Empire may in future be effectively promoted and safeguarded.

(2)—That his Majesty's Government take immediate steps to consult the Governments of the Dominions Overseas, and ascertain (a) their views with regard to reciprocal trading, and (b) the regulation of trade relations with enemy countries and the control of businesses in the colonies managed or owned by the subjects of enemy countries, it being important that their views be first obtained before any definite steps are taken by the United Kingdom.

(3)—That his Majesty's Government be urged to inquire into the desirability of subsidising or otherwise protecting for a period those industries which have since the commencement of the war been engaged in the manufacture of articles formerly made to a large extent in enemy countries.

(4)—That the question of preferential reciprocal trading relations between all parts of the British Empire, reciprocal trading relations between the British Empire and Allied countries, the favorable treatment of neutral countries and the regulation by tariffs or otherwise, of trade relations with all enemy countries be considered by his Majesty's Government, and steps taken to render impossible a return to pre-war conditions.

(5)—That his Majesty's Government be asked to take into consideration the present banking system of the country with a view of ascertaining whether any steps can be taken further to facilitate and encourage industrial enterprise.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

ECCENTRIC DEVICE FOR TURNING CAMS

By H. C. F.

THE method in general use for turning cams and other irregularly-shaped pieces of work is by the use of a special arrangement whereby a former is used to impart the necessary reciprocating motion to the tool. By this method a plate or former, the shape of which corresponds to the shape of the piece to be machined, is bolted to the face-plate and a tracer arm or pointer is held against it by means of a weight or spring. As the lathe spindle revolves, the arm follows the irregular shape of the former, and by suitable mechanism causes the lathe tool to move back and forth in the desired manner.

Where the work can be produced in a lathe, the foregoing method is most generally adopted for shapes of the description mentioned, but for simple cams of a symmetrical cross section, as shown in Fig. 1, the following arrangement has given every satisfaction in actual use:

By referring to sketch Fig. 2, an idea of the arrangement will be obtained. It will be seen that a large gear A is fitted to the lathe spindle and meshes directly with the pinion B, in which is inserted a feather key of suitable dimensions. The pinion is made a sliding fit for the shaft C, the latter having a keyway milled along its entire length to correspond with the inserted key in the pinion. The shaft is supported in the two boxes H, as shown, these being secured to the lathe bed and carriage respectively, and fitted with suitable bronze bushings. The end of the shaft E is turned eccentrically and to this diameter is fitted the connecting rod D, the opposite end of which engages with the pin G, which in turn is securely fastened to the face of the cross-slide. It might also be noted that the cross-feed screw has been previously removed, this being done in order that the cross-slide will be free to move as required.

The methods of setting up the device for operation are somewhat complex and a considerable amount of care must be taken to so arrange the tool and cam that a comparative depth of cut will be taken. The cam is tightly held on a suitable mandrel, and, after being supported between centres, the lathe spindle is turned until the side X (Fig. 1) of the cam is in a perpendicular position. The lathe carriage with its special attachments is then run back in the direction of the tailstock until the outer end of the shaft C is sufficiently clear of the bearing to allow the pinion B to be removed. The shaft C is next turned by hand until the eccentric E is at the extreme inward limit of its throw, or in the position as shown in Fig. 2. When the cam and shaft are thus set, the pinion is again replaced and the carriage moved forward in readiness to commence the cut. In replacing the pinion, care must be taken that neither the cam or shaft are moved to any appreciable extent from the positions in which they were first set, as otherwise the outward or inward throw of the eccentric would not be in unison with the throw of the cam. The natural result would then be an extreme unevenness of cut. (The device can also be set by having the side O of the cam in a direct horizontal position with the centre axis of the lathe, while the eccentric shaft is turned until the throw is at the extreme outward limit. The pinion is then replaced in the same manner as was previously mentioned).

When the device is thus set up, the lathe is ready for operation, the tool being fed in to the desired depth by means of the compound feed screw. The longitudinal feed is next engaged, and as the carriage moves along the bed, the eccentric shaft and connecting rod move with it, the revolving shaft imparting the desired reciprocation to the tool.

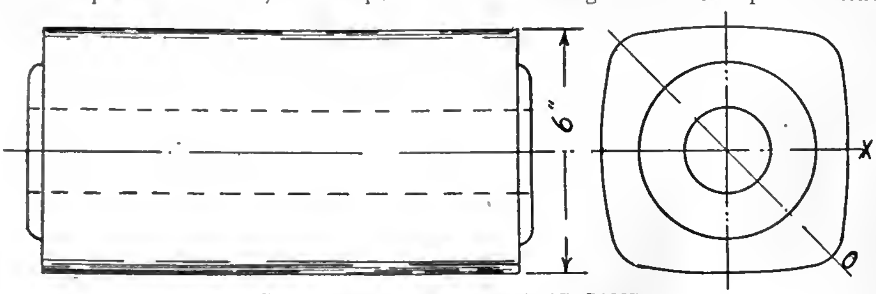


FIG. 1. DEVICE FOR TURNING CAMS.

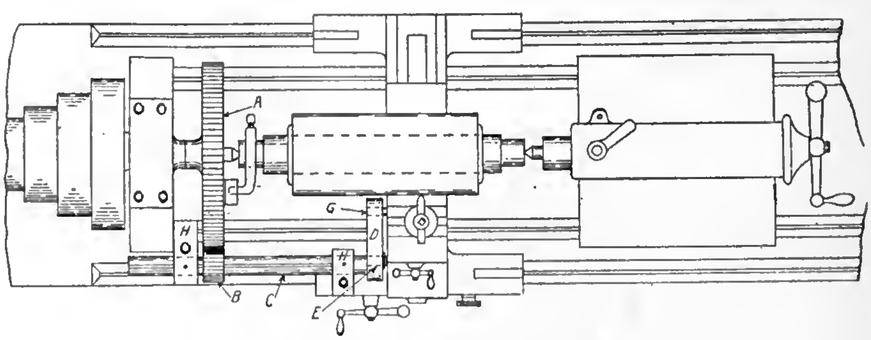


FIG. 2. DEVICE FOR TURNING CAMS.

LINING-UP PLANER WORK

By F. H.

THE use of wedges and packing of various shapes and sizes for lining up work on planers is one of the practices in connection with planer work that should be, wherever possible, eliminated. It not only requires a longer period of time to set-up the work but it also proves in many cases, a very unsatisfactory procedure.

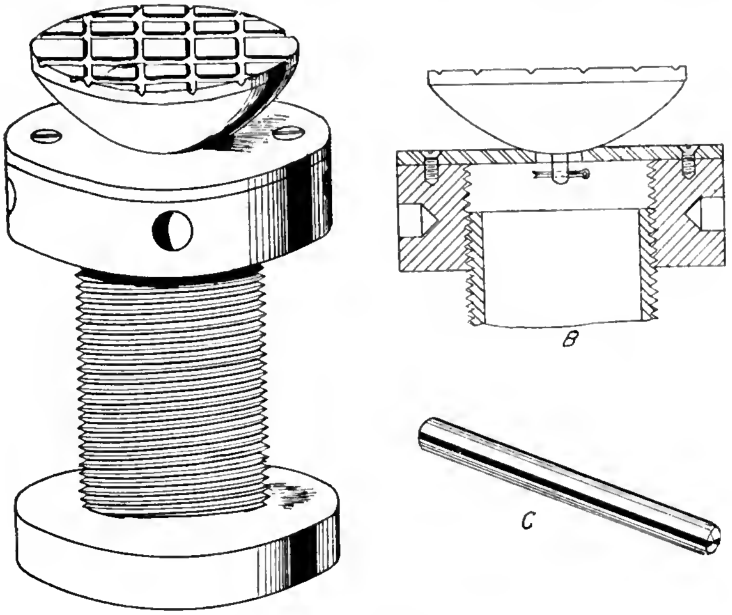
A more suitable method, and one that is employed in great many instances, involves the use of jack screws. These of course can be easily obtained, and at a reasonable price, but, to obviate even this outlay, a suitable jack screw can be cheaply and simply constructed with materials to be found in almost every shop.

The design of the jack-screw is shown in the accompanying sketch. A piece of ordinary 1½ inch pipe is threaded for its entire length, and one end is screwed securely into a suitable cast iron base. To the other end of the pipe is fitted a suitable nut which is threaded to operate freely, and to which is secured an adjustable cap. An idea of the working features of the latter may be obtained by the sectional view B.

It will be noted that a plate, having a hole of suitable size drilled through the centre, with the top counterbored to

a convenient radius is bolted to the top of the nut. The cap proper, is made spherical in shape with a flat top and has a small lug fitted into the bottom as shown. The lug is left considerably smaller in diameter than the hole in plate, so that when the cap is in position it will be free to adjust itself as desired, while, at the same time, a cotter pin which is inserted in the lug prevents the cap from coming out.

From the foregoing it can be seen that the cap is made adjustable to any irregularities that may occur in the casting being levelled up. Raising or lowering of the nut is accomplished through a small lever engaging with the holes drilled on the nut side, and, while the distance through which it can be raised or lowered is somewhat limited, it is still sufficient for the purpose intended.



LINING UP PLANER WORK

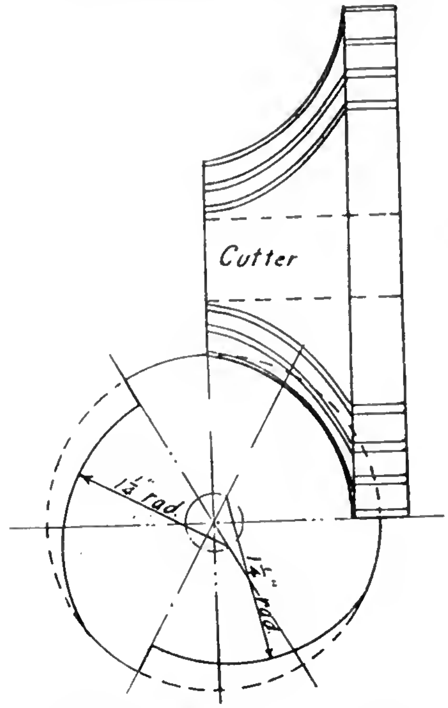
work. It is adjustable up or down in the split bracket, being locked by the two cap screws D. It will be seen that the clamping bracket is sawed under at E in order to bind evenly on the piece.

EXPANDING MANDREL CRITICISM

By G. Barrett

IN the Feb. 17 issue of Canadian Machinery, C. F. White offers a criticism on the expanding mandrel described in a previous issue. Mr. White's contentions as to the flaws in the mandrel there featured are, I may say, wholly disproved by the fact that, at the present time there are sixteen of them in operation at the plant in which the writer is employed, and each is producing excellent results.

This style of mandrel is not intended for employment on shells that have a finish bore, being used entirely on the rough forgings. If employed on the finished shell, all danger of the dogs marring the bore could be removed by having a plain surface on the dogs rather than the serrated effect. As for the mandrel being unsuitable for rough forgings on account of variation in size, straightness and taper, I might say that during my entire shell experience I have never met with a case in which the forgings varied to such an extent that the mandrel would not accommodate itself to them.



EXPANDING MANDREL CRITICISM.

I do not agree with Mr. White's remark that there will be a strain on the point X as shown by his sketch. The dogs are left square on the bottom, and are not of the same radius, as that of the mandrel, and furthermore, they are made to fit the slots in the casing so as to slide without play.

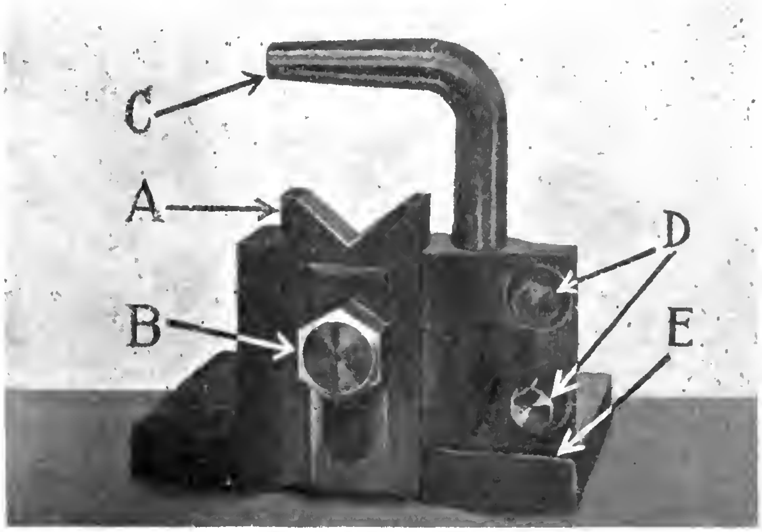
Referring to the accompanying sketch the method of machining the convex surfaces is shown. The mandrel is placed between the indexing centres on the milling machine table and divided into three equal spaces. A concave cutter similar in design to that shown in the sketch is used. By spacing off the mandrel in this manner there will be no difficulty experienced in striking the arcs from a centre.

J. H. Mead is now president of the Spanish River Pulp & Paper Co.

CONVENIENT STEADY-REST FOR MILLING MACHINE

A. E. Granville

THE steady rest shown is useful for many milling machine jobs, and as it is easily made, will interest mechanics generally. The base is made of cast iron and the vee-support A slides in a guide planed in it. This support is made of steel, hardened and ground smooth in the vee. It is locked in position by means of a bolt B, the nut for which is on the back of the block. The over-arm C is made of tool steel hardened and polished where it comes in contact with the



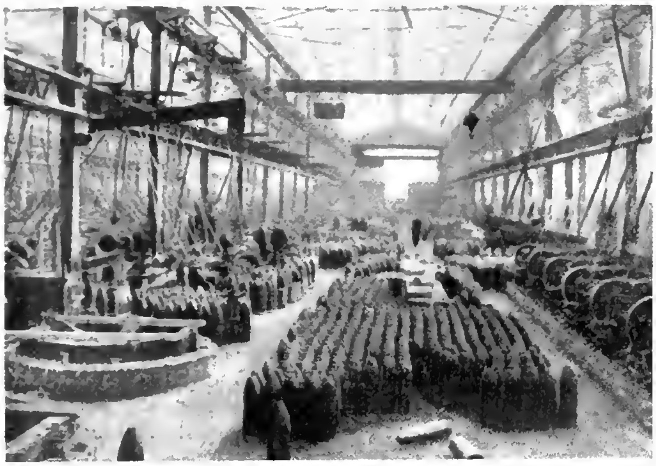
MILLING MACHINE STEADY REST.

CONTEMPORARY WAR ARTICLES

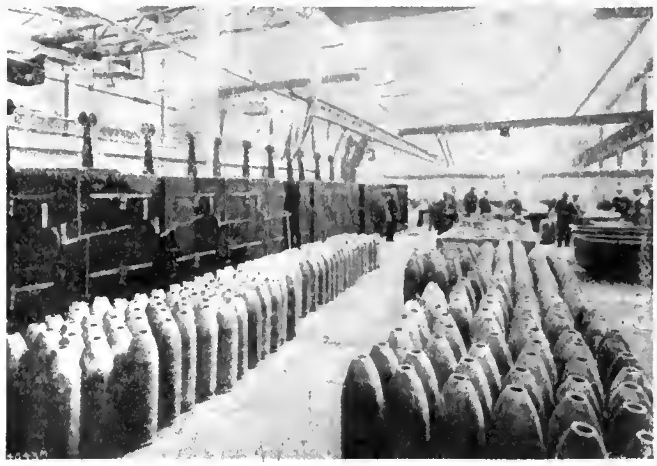
Embracing Information and Data Drawn from a Variety of Sources Relative to and Arising from the Prosecution of this Many-Sided European War

ONE OF BRITAIN'S NEW PROJECTILE-MAKING PLANTS-I.

A LARGE part of the feeling of disquietude—not yet entirely at an end—in connection with the production of a sufficient supply of shell—shrapnel and high explosive—has been due to an inadequate knowledge on the part of laymen as to the extent of the plant necessary for producing shells, and the number of operations and high degree of accuracy involved in their manufacture.



PRESSING COPPER BANDS ON LARGE SHELLS.



LARGE SHELL VARNISHING DEPARTMENT.

As has been time and again pointed out, unskilled labor or partially-skilled labor is utilizable, and is now being employed in increasing measure in most of the operations; this fact suggested that the processes were simple, alike as regards the extent of mechanical appliances and the degree of intelligence necessary on the part of workers. This, however, is one of those cases where the excellence of the machine in its mechanical accuracy and completeness supersedes experience and mechanical skill on the part of the operative. As we had not contemplated war, and, so far as the army was concerned, were ill-prepared to meet the drain of warlike operations, it followed that before the production of shells on a sufficiently immense scale could be undertaken the factories had to be organized, or constructed anew, and equipped with the most efficient appliances, so arranged as to ensure the greatest output for the minimum manual effort.

Artillery Feature Dominant

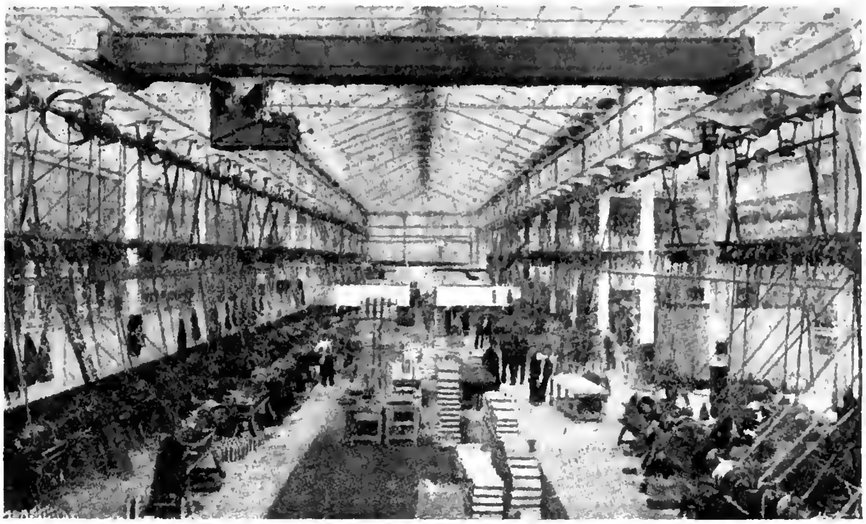
When it was realized that the tactics in the field demanded a domination of artillery over infantry or cavalry action, the problem which faced the authorities was the question not only of increasing the emergency supply by almost superhuman effort on the part of the workers available, but also so to augment the producing facilities of the country as to make certain that the immense flow of shells from the muzzles of all the guns in action could be maintained at its maximum volume over a lengthened period.

The argument was used that even little machine shops should be re-arranged to make shells, or at least to execute one or the other of the many operations which constitute the long line of manufacturing processes. It was ultimately realized, however, that, with the manual resources of the country taxed to the fullest degree, the transport of shells over great distances was wasteful in the extreme. We have known of cases where shells have had to travel miles between the forging and the finished machinery; 300 yards generally sufficing in well organized works. The authorities, therefore, acted wisely in deciding that while extraordinary measures, however inefficient, might be justified to meet immediate emergency, the preferable course was to arrange for the rapid completion of immense new factories, where the transport would be minimized and the

EXTERNAL VIEW OF ONE OF BRITAIN'S NEW PROJECTILE-MAKING PLANTS

organization and equipment would be such as to achieve the greatest production with the smallest possible number of men of military age.

Without entering into the details of manufacture, which might be helpful to the enemy, it is possible to convey even to the lay mind such an idea of the energy and enterprise shown in the bringing into action of such a shop as to dispel a large proportion of the misunderstanding and criticism, due to incomplete knowledge, regarding the action of the authorities in meeting the demand for shells.



MEDIUM SIZE SHELL MACHINING DEPARTMENT.

New Factory Layout

The shop illustrated, which embraces 10 acres under the glass roof, is one of many now in full operation, turning out thousands of shells per day. Others are being as rapidly brought to the same state of efficient production. Six months prior to the taking of some of the photographs which we reproduce, the site of this immense shop was used as a coal and iron store, and the first operation was the clearing away of between 5,000 and 6,000 tons of such materials. The ground had to be levelled and the foundations put in, and there was then erected the steel building shown, which in its completeness and permanence equals anything yet done.

Moreover, the admirable details of the design, notably for supporting cranes and for carrying the lines of shafting for the machine tools, will easily be appreciated by a close study of the various illustrations. There are nine bays of an average length of 370 ft., with a total floor space of 196,600 sq. ft. Two of them are arranged as press shops for the forging from bars into shell cylinders—either of the shrapnel or high explosive type, ranging in diameter from the smallest to the largest required.

The smaller shells are machined in an upper floor over one end of the machine bays, the larger shells in the remaining bays, and railway tracks are laid for the movement of the shells to the bays having machine tools installed for undertaking the finishing operations. Rapidity of output is facilitated by each machine being confined not only to one size of shell, but to one separate operation. The minimum of time is, therefore, involved in the setting of the lathe, while the machinist, when initiated into the carrying out of this one operation, becomes very expert, and requires only the slightest supervision.

The Power Plant

In the power station, the hydraulic accumulators form a prominent feature. The principal unit is the installation of pumps for supplying pressure water to the presses for forging the bars into shell cylinders. There are nine of these, each working up to 1,500 lb. pressure per sq. in. They are steam-driven, and the aggregate power developed under ordinary working conditions is about 3,000 horse-power. These pumps deliver to two accumulators, 26 in. in diameter by 20 ft. stroke, and the supply of pressure water is controlled by electrical and mechanical devices, which come into action as the accumulator approaches the top of its stroke.

For hydraulic pressures of 4,480 lbs. per sq. in., there are three horizontal pumps, developing 510 horse-power, delivering into a pair of accumulators, 15 in. in diameter by 16 ft. 6 in. stroke, and similarly controlled. Steam is supplied by four water-tube and five Lancashire type boilers, all fitted with mechanical stokers. Two of the water-tube boilers are of Stirling type, and two of Babcock & Wilcox design, all being fitted with chain-grate stokers and induced-draught fans. The boilers are fed with town water by vertical feed pumps. Electrical and pneumatic power is supplied from a separate central station.

Raw Material and Forging Provision

Raw material is brought to the factory in bars of suitable diameter and stored in racks for ready use. Adjoining these are the parting-machines which cut the bars into the required lengths for the manufacture of single shells. The furnaces for heating these are distributed along the two press-shops and contiguous to the presses. The latter range in power from 160 tons for small shells to others of 2,500 tons for the largest. Hydraulic pressure is maintained at two levels—1,500 lbs. and 4,480 lbs. per sq. in., according to the size of the presses.

These are arranged with two dies, so that the shell is forged at two operations in the larger of the presses, the dies are accommodated on hydraulically-actuated

LARGE SHELL MACHINING DEPARTMENT.

carriages, which move one or other of them under the forging tool. The shell cylinder, after being forged, travels across the several bays, as each of these is arranged to deal with one or two sizes of shell only.—Engineering.

SPECIFICATION REVISION FOR SHELL STEEL

UNDER normal conditions shell steel is made under such rigid specifications that its manufacture was undertaken by comparatively few firms, says the Liverpool Journal of Commerce. The object sought by the authorities was to obtain a material of the highest possible grade, and it was a simple task to defend this practice when the required output was small and there was ample time in which to produce it. Experience in the present war has, however, clearly indicated that the quality of the steel so long as the material would withstand essential, as distinguished from refined tests, was of far less importance than the quantity which can be produced within a limited period.

Makers of steel for shellmaking have been agitating for some time past for a revision of the specification. They recognize far better than War Office officials, who are inclined to play for safety, that the needs of the government cannot be met unless the regulations governing quality are relaxed on immaterial points. That is one of the lessons taught during the past year, and it is hoped it has now been learned by those who are in a position to apply its teachings.

Steelmaker and Scientist in Agreement

Fortunately the steelmaker did not lack the support of the scientist in the campaign against rigidity of specification. No less an authority than Dr. Stead came to his aid; and an investigation which was carried out in conjunction with leading firms on the north-east coast, showed that here, as elsewhere, Germany had demonstrated how the needs of the war could best be served. Mechanical and other tests of shell steel used by the enemy, which were made on specimens picked up after the naval bombardment of the North East Coast showed that it was not necessary to use steel of uniform quality, that a relatively large percentage of nitrogen, and even the presence of sulphur and phosphorus up to 0.07 per cent. did not prejudicially affect the quality of the shell, as these impurities were present in some of the toughest and best of the German specimens. The teaching was clear that the output of steel for shell making need no longer be restricted by clinging to the old shibboleths.

Dr. Stead has expressed the opinion that if the mechanical tests on shell steel are found to be conclusive it would be a national crime to reject material on any mere chemical specification. This clear pronouncement may not improbably cause some disquietude among those who have pinned their faith to the tests by chemical analysis, but this is not the moment to allow differences between rival schools of scientific thought to exert any influence. The thing that matters is to produce a steel which will meet the needs of shell manufacture, and if the amendment of the specification will achieve this, and at the same time enable the output to be materially increased, there ought not to be any hesitation in adopting the amendments which have been proposed.

QUEBEC MINERAL PRODUCTION

HON. HONORE MERCIER, Minister of Colonization, Mines and Fisheries, tabled in the Quebec Legislative Assembly on February 25, a preliminary statement of the mineral production in the province during 1915. The mineral production for 1915 was valued at $10,796,348, a decrease of $936,347, as compared with 1914. The best year, 1913, showed production of a value of $13,119,811.

A comparison of figures in the different products of the mines shows asbestos to lead with a value of $3,544,302, while in the class of structural materials, cement leads with a value of $2,805,374. Copper and sulphur ore netted $1,020,605, and limestone and marble $1,477,362.

The falling off from 1914 was in the structural materials, the decrease there being 28 per cent., while the actual products of the mines showed an increase of 32 per cent.

The chief increases in 1915 over 1914 are in asbestos, copper and sulphur ore, magnesite and the heavy decreases in brick, cement and granite, every one of the structural materials showing a decrease.

The report states: "The production of magnesite has been greatly stimulated by the war. Formerly Austria was the source of the world's supply of this material for refractory purposes. From a previous maximum figure of $9,645, the shipments of Quebec magnesite reached $137,304 in 1915. Chromite mining has also benefited by the present industrial conditions. The shipments of chromite jumped from $1,210 in 1914 to $221,287 in 1915.

During 1915 the number of men employed in the mines, quarries and concentrating mills of the Province of Quebec was 5,777, as compared with 6,956 for the previous year. Their wages totalled $3,109,549. There were 173 accidents, of which 13 were fatal.

CANADIAN MUNITIONS WORK DEVELOPMENT

ACCORDING to a statement issued on Feb 23, by the Imperial Munitions Board, Ottawa, 454 Canadian firms are engaged in the machining and assembling of shells, in the production of component parts, in the production of powder and explosives, and in the loading of shells or parts. These factories are distributed from Halifax and St. John in the east to Victoria, B.C., in the West. The board has the responsibilities of purchasing the steel and the component parts entering into the shells. They arrange for the work to be done upon these parts, and for their shipment to machining and assembling plants, and they are thus responsible for a continuous supply of material to keep the assembling factories employed

$5,000,000 A Week.

The Board stated that over $5,000,000 per week is paid out for materials supplied and work performed. It is estimated that employment is given to 200,000 to 250,000 persons in Canada. The staff employed at the offices of the Board in Ottawa number 150. There are 2,300 inspectors distributed in the factories and machine shops engaged in the production of munitions, 1,400 of them being under the direction of Major Ogilve, an Imperial officer with headquarters at Quebec.

Business Administration

The board has developed an organization for the administration of its business. George Edwards, chartered accountant, Toronto, has assumed oversight of the accounting and the disbursements. Through the courtesy of Lord Shaughnessy, Edward Fitzgerald, of the purchasing department of the C. P. R., has assumed charge of all purchases and contracts.

Volunteers

Allan McAvity, Canadian Buffalo Forge Co., Berlin, Ont., volunteered for service, and has been given supervision of production in the machining and assembling plants. E. A. Schofield, of the firm of Jones & Glassco, Montreal, has been given the duty of seeing to the distribution of component parts of shells to the various factories. R. J. Durley, lately professor in McGill University, Montreal, has taken charge of the production and standarization of gauges. Bertram Seton, of Toronto, and recently from Scotland, is in charge of the adjustment department to provide for a fair settlement between the various manufacturers concerned for material declared faulty by the inspectors. F. W. Lamont has been placed in charge of all matters pertaining to insurance upon material belonging to the board.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

COMPOSITION OF FILLING MATERIAL A FACTOR IN AUTOGENOUS WELDING

By C. Royers.

When a boiler maker manufactures a tank by oxy-acetylene welding, or a machine shop has a broken piece repaired by this process, they are directly interested in the strength of their welds and wish them to stand up as well as the rest of the piece. Outside of suitable equipment and skill of the welder, the results obtained depend largely on the selection of the welding material which has been fused in the weld. It is desirable that everybody doing welding should know in what way the filling material affects the results of a weld, and the reasons which guide the choice of a suitable material.

It is well, first, to mention that in welding the metal is fused drop by drop, and is subjected to a tremendous temperature, to the action of the gases of the flame and of the air, and that chemical action is liable to take place independently of the skill of the welder, and consequently it is difficult to expect the metal fused in the weld to be as sound as the metal of the piece to be welded, which metal has been prepared in large quantities in a furnace made for the purpose, and which has been subjected to mechanical and thermal treatment to improve its qualities.

In order, then, to obtain the best efficiency in a weld, it is necessary to choose welding material purer than the piece to be welded—that is to say, free as much as possible from impurities liable to be injurious to the weld, and to such pure material should be sometimes added elements capable of combating the ill-effect of the influences of the fusion under the blowpipe. Very small quantities of impurities are liable to destroy the mechanical properties of a weld, and it is the effect of these impurities we are going to consider.

Welding of Iron and Mild Steel

For welding plates and boilers, the welding material should be as pure as possible—that is to say, should contain the least carbon, sulphur and phosphorus obtainable. The best quality of Norway or Swedish iron as a rule fulfils these conditions.

Influence of Carbon

Though carbon increases the tensile strength of iron in a weld, it decreases its elongation, and as any weld always shows a decrease in elongation, it is well to keep the carbon low in order to avoid any reduction in elongation. Moreover, carbon increases the tendency of steel to crystallize under the influence of alternate expansion and contraction as in boiler work, or under shocks and vibration, etc.; also mild steel at 200 degrees C. temperature loses some of its property of elongation with increased carbon. Consequently, in boiler work it is absolutely necessary to use a welding material very low in carbon in order to decrease the tendency of the metal to crystallize under working stress and produce cracks and break later on.

Influence of Sulphur

Sulphur, which is found in almost every welding material, combines with the iron and makes an eutectic (ferrite and sulphur), which becomes isolated between the molecules of metal and renders the metal brittle when hot.

This eutectic becomes liquid at cherry red and surrounds the solid molecules of iron. For this reason, welding material which contains any quantity of sulphur cannot be hammered without developing cracks, which will spread between the solid molecules of iron.

Influence of Phosphorus

Phosphorus in the welding material induces, during crystallization, the formation of large crystals, which considerably increase the brittleness, and are liable to prove dangerous in the welding of pressure tanks and reservoirs.

For the welding of boiler plates and plate work, use Swedish or Norway iron of good quality to obtain the soundest weld possible with the maximum elongation. There is no doubt that the tensile strength of the weld will be lower than in using mild steel, but the elongation will be better and possibility of breaking after a period of use will be eliminated.

It is well to add here that one of the greatest evils in welding is the formation of oxide of iron, which dissolves in the molten iron, and which decreases the elongation and reduces the tensile strength, but up to now no sufficiently tried element has been found which, added to the welding material, will eliminate the ill-effect of the oxidation produced. It is to be hoped that filling material containing a harmless deoxidizing element will be manufactured in the near future, but at the present time the best thing to do is to use good quality Swedish and Norway iron, which at the present time are known as the purest iron, containing the least amount of carbon, sulphur and phosphorus. Beware of material sold as Swedish or Norway iron which has none of the qualities of these materials, but the name only, or which contains too much slag.

The increase of price for a good welding material should be of small consideration, as the percentage of it in the cost of a weld is too small to justify the risk of turning out poor work; consequently, for boiler plate and mild steel work, use the purest iron possible to be obtained, free, as far as possible, from carbon sulphur, phosphorus and slag, and which flows well when melting.

Welding Material for Steel Pieces

The remarks above in regard to sulphur and phosphorus apply just as well for the welding material used for steel pieces. Generally, for such pieces the quality of elongation is not such a requisite as for plate work, and, therefore, the presence of carbon will not be objectionable, and will, on the contrary, increase the tensile strength and the toughness of the weld. In such a case, steel containing as little as possible of sulphur and phosphorus should be selected, and the amount of carbon should correspond to the amount of carbon in the piece to be welded, or be slightly above.

Welding material, such as vanadium steel, chrome steel and nickel steel has been proposed for such work, but experiments so far do not seem to be sufficiently conclusive to justify any superiority for either of these materials. There is no doubt that almost any well-made weld will withstand the stresses it has to support, and mild steel rods of good quality have given very good satisfaction.

In regard to high carbon steel, it is well to mention here, that although it can be welded under the flame of the blowpipe, the results are not very good compared with the strength of the material itself. This is due not so much to the weld itself, but that under the high temperature of the flame of the blowpipe, the parts adjacent to the weld begin to segregate, therefore, the structure of the metal is affected and its properties decreased. Consequently, when high carbon pieces are subjected to heavy stresses, it will not be satisfactory to try to weld them.

In the welding of cast iron the welding material should not contain an excess

of sulphur which, under the flame of the blowpipe, will tend to the formation of blowholes which will decrease the strength of the weld. The manganese should also be low, as it will tend to increase the amount of combined carbon in the weld which will render the weld hard to machine. On the contrary, cast iron filling rods should contain a larger amount of silicon than ordinary cast iron, as this silicon will help to produce a grey cast iron easily machineable.

Cast iron rods should be made with new material altogether without any scrap, should contain no sand, and about 2½ to 4 per cent. of silicon, with less than 0.5 per cent. manganese and sulphur. It is poor economy to try to obtain filling rods made in an ordinary foundry without special care and attention to the percentage of elements contained, just for the sake of a few cents and take the risk of making unsatisfactory work. Experience has shown that such manufacture, by an ordinary foundry, is not satisfactory, except if this manufacture be made a specialty, and in that case, the cost of filling rods will be proportional to the purity and the special care required to obtain good material.

Welding of Brass

To obtain a satisfactory weld in brass, it is essential that a welding material made of absolutely new metals should be used, the composition should be similar to the metal to be welded, and a very small amount of aluminum should be incorporated in the welding material, just in sufficient quantity to destroy the oxide formed during welding and prevent the vaporization of the zinc. The mixing of this small quantity of aluminum is a delicate operation and cannot be performed properly except by specialists.

Welding of Bronze

The above remark will apply also to the welding of bronze, though the element incorporated in the welding material to insure soundness should be phosphorus instead of aluminum. It is well to remark here that the percentage of phosphorus should be exactly verified and homogeneously incorporated in order to obtain good results. No scrap material should be used for making such welding rods so as to avoid absolutely the introduction of any trace of lead or zinc in the metal which would disturb the fusion and produce blowholes.

Welding of Copper

A satisfactory weld in copper, i.e., showing sufficient tensile strength, malleability and elongation cannot be obtained without using a specially prepared copper filling rod. This is due to the fact that copper being heated oxidizes readily and the oxide of copper produced, is dissolved readily in the molten copper, reducing considerably the strength and the ductility, thus rendering the metal brittle.

Provided, that a welder knows how to weld copper and has a suitable equipment, he may obtain very satisfactory results in using a copper filling rod which contains a certain pre-determined quantity of phosphorus which serves as a deoxidizer. To have a suitable copper welding material, it is not sufficient to use any quality of phosphorus copper, but the amount of phosphorus should be accurately controlled and evenly distributed throughout the material. The making of such material is difficult and increases the cost of the products, but enables one to obtain a sound weld, otherwise impossible to produce. Such material permits the manufacture of practically seamless copper articles, instead of apparent brazing, which may become faulty after a period of use.

Welding of Aluminum

Filling material for the welding of pure aluminum should be composed of pure aluminum wire free from silicon which destroys the strength of the weld. For the welding of cast pieces of aluminum, a welding material made of absolutely new metals and about the same composition as the piece to be welded will give the best results. Scraps should be entirely avoided in the making of such material in order to avoid impurities, principally copper and silicium.

Summary

To summarize, we may say that, as under the flame of the blowpipe the metals are liable to be altered, it is absolutely necessary, in order to obtain the maximum results, to use either pure metal or pure metals to which some special beneficial elements have been added. The manufacture of filling material has become a special industry, and consequently, it is recommended that such metals be obtained from firms making a specialty of them, and who are ready to spend the time and money to insure the supply of good products. Even in the case of reliable firms, jealous for their reputation, it is well, if any doubt arise as to the quality of the products they sell, to have same analyzed.

Finally, it is very poor policy to buy welding material as regards price alone, as instead of economizing a few cents on the cost price, one takes a chance, by obtaining poor welds, of losing all the money invested in labor and welding gases, which items are really the main expenses of the cost of welding.

$1,000,000 SHIPBUILDING PLANT FOR CATALINA, NFLD.

W. F. COAKER, head of the Fisherman's Union, of Newfoundland, was in Halifax, N.S., recently, taking initial steps for the establishment of what he says will be a million-dollar shipbuilding plant at Catalina, on the north coast of the colony, to be ready for operation in 1917. Should the enterprise materialize, it will be somewhat serious for the City of St. John's, which previously has been the headquarters of the industrial life of the colony. Mr. Coaker, in speaking of his new enterprise, said: "The sealing industry has long been a great one in Newfoundland, but has dwindled from a million dollars a year to $250,000. The principal reason for this is the scarcity of suitable ships to carry on the industry. The situation has become more pronounced since the war, due to the requisition by the Government of so many of the steamers used for the fisheries. There are only about six or seven ships suitable for carrying on the seal fisheries at present. There used to be a fleet of at least twenty-five. When the shipbuilding industry was booming no difficulty was experienced in keeping the sealing fleet up to maximum, but this, too, has dwindled until it has practically gone out of existence."

Mr. Coaker said wooden ships were more suitable for the sealing industry than iron, some of the latter being too large and the cost of maintaining and operating them too great.

UNITED KINGDOM SHIPBUILDING SUPREMACY

ALTHOUGH its shipbuilding yards were more fully engaged on warship work during 1915 than in any previous year, the United Kingdom is still maintaining the lead as the most important producer of mercantile shipping, being demonstrated by the latest statistics issued by Lloyd's Register of Shipping. The appended table has been prepared in order to show the total gross tonnage of merchant vessels of over 100 tons each launched (a) throughout the world, and (b) in the United Kingdom, while the third column shows (c) the percentage of the world's total output for which British shipbuilders have been responsible during each of the last six years:—

	World	U.K.	%
1910	1,957,853	1,143.169	58.4
1911	2,650,140	1,803.844	68.0
1912	2,901,769	1,738.514	59.9
1913	3,332,882	1,932.153	57.9
1914	2,832,753	1,683.553	59.0
1915	1,201,638	650.919	54.0

In comparing the above figures it should be remembered that the 650.919 tons of merchant shipping launched in the United Kingdom last year only includes those vessels intended for purely mercantile work. It should also be added that the total tonnage launched throughout the world in 1915, as recorded above, excludes those vessels consigned to the water from German, Austrian, and Belgian yards.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

GENERAL AND CONDENSER SERVICE CENTRIFUGAL PUMPS

OUR illustrations refer to a line of horizontal and vertical shaft centrifugal pumps for general services and for condenser work, being built by the Wheeler Condenser & Engineering Co., of Cartaret, N.J. This company has been building centrifugal pumps for over two decades, most of them being used, however, in connection with condensers. The new line of pumps is suited for all services.

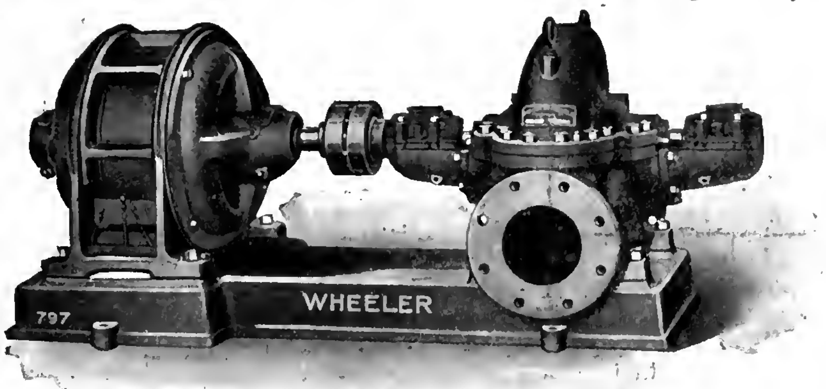


FIG. 1. TYPICAL SMALL MOTOR-DRIVEN PUMP FOR TANK OR STAND PIPE SERVICE. CAPACITY 1000 GALLONS PER MINUTE.

A small motor-driven unit for tank or stand pipe operation is shown in Fig. 1. Referring to the sectional illustration, it will be seen that this pump conforms to the most recent advances in centrifugal pump construction, having a two-part divided casing, with the suction and discharge nozzles in the lower half. The impeller is of the closed double suction type, protected by labyrinth wearing rings. The shaft is protected from the water by bronze sleeves, which screw on to the shaft and extend clear through into the bearing bracket boxes. Bearings are of the ring-oiled type, and in the outboard bracket, there is located a ring-oiled thrust bearing. A feature of these pumps is the large size of the bearing brackets and the fact that they are bolted to the pump casing, instead of being cast integral with them.

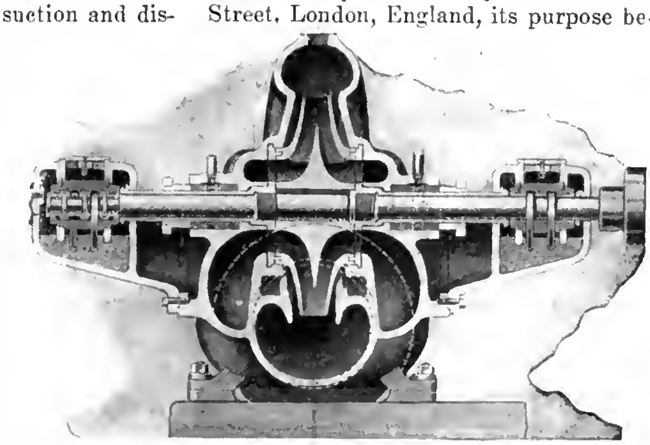


FIG. 2. SECTIONAL VIEW OF CENTRIFUGAL PUMP SHOWING WATER PASSAGES IN CASING AND IMPELLER, ALSO SHAFT PROTECTING SLEEVES.

In the manufacture of these pumps, particular attention is given to the casting of impellers, since the work of the designer in selecting the correct impeller dimensions may be entirely defeated by crude or careless shop work. The impellers are cast in dry sand or skin dry molds, and the cores are made from a core "sand" resembling a fine powder, which when properly mixed, weathered and baked into a core, gives a surface to which the metal adheres perfectly, giving a finished impeller casting true to pattern.

COMBINATION RECESSING AND FACING TOOL

THE combination tool here described and illustrated is a product of the Selson Engineering Co., 85 Queen Victoria Street, London, England, its purpose being the accomplishment of simultaneous recessing and facing operations on small capstan lathes. The tool is especially adapted for cutting the recesses at the back of the threads in "gaines" and No. 100 Graze fuze bodies, and for facing the front of the body at the same time. Additional operations in the manufacture of fuzes, and other small parts, can also be conveniently and expeditiously performed with the tool.

Fig. 1 shows the general appearance of the tool, which consists of a mild-steel shank and body, with a slide carrying the cutting tools. The slide has a cross-travel of ½ in., and is operated by a cam-lever, mounted on the body and bearing against a roller on the slide, as shown; this arrangement provides a sensitive feed for the tools. The internal construction of the apparatus is shown in Fig. 2, but as it is frequently supplied for recessing only, the facing-tool has been omitted from the drawing.

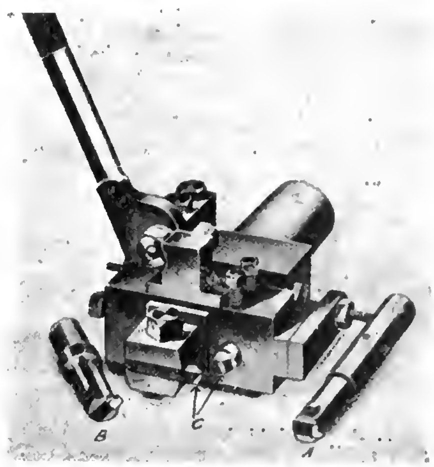


FIG. 1. ASSEMBLY OF COMBINATION RECESSING AND FACING TOOL.

The recessing-tool is mounted in a holder, having a cylindrical shank, which is fixed by a set-screw, and when a facing-tool is used it is made from a rod of circular section, and held in place by two set-screws, as seen in Fig. 1.

It will be noted from the drawing, Fig. 2, that the body contains a helical spring, which bears at the right-hand end on a plug screwed into the body, and, at the other end, on a collar screwed on to a bolt, which passes completely through a lug on the slide, and the lug bears against a stop-nut, so that when the slide is moved to the right, the spring is compressed, and by this means the slide is returned to its original position as soon as the lever is released. The travel of the slide is limited by a pair of lock-nuts, shown on the left-hand end of the bolt in Fig. 2, and these lock-nuts are adjusted to suit the required depth of cut.

In operation the combination tool is

mounted in the turret with its tool-holder in line with the hole in the work, the adjustment being effected by means of the stop-nuts on the right-hand end of the bolt. The turret-slide is then brought forward to a stop, and the cutter fed into the work by the lever as far as the lock-nuts will permit. When this point is reached, the lever is released, to allow the tool to return to its original position, and the turret slide is then brought back.

As illustrated in Fig. 1, the tool is arranged for recessing the internal thread in the base of the No. 100 fuze body, and simultaneously facing the end, these operations being performed by the cutters lettered C. The hole is, in this case, large enough to clear a tool-holder of the form illustrated. For recessing the backs of the threads in smaller holes, a tool of the type lettered B is employed, this tool being used in the screwed hole in the front end of the No. 100 fuze body. The tool lettered A, which, it will be noticed, has two cutters, was designed for recessing simultaneously two internal threads of different diameters in

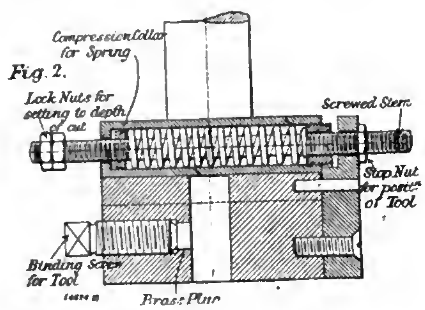


FIG. 2. SECTIONAL DETAIL OF COMBINATION RECESSING AND FACING TOOL.

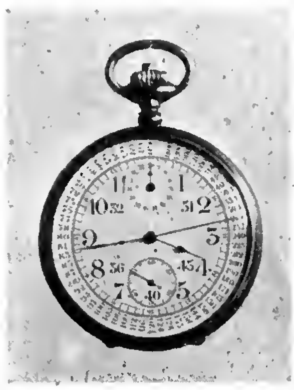
"gaines," but the design of the latter has now been altered, so that this tool is no longer used. The combination tool is, of course, quite suitable for external recessing work, and, by employing a former in the tool-post on the cross-slide of the lathe, it can also be used for taper boring.—Engineering.

TIME AND MOTION STUDY WATCH

WHAT is known as the Master Chronograph—an improved type watch for taking time and motion studies, has been placed on the market by M. J. Silberberg and associates, People's Gas Building, Chicago, Ill. The watch may be used as an ordinary timepiece if so desired.

It operates entirely from the crown, being of the stop, start and flyback type. The timepiece portion of the watch has seventeen jewels and in addition there are divisions in seconds and fifths for the time study feature. The figures on the extreme outside of the dial designate the number of operations that can be performed in an hour where the time for a single operation is less than 1 min., while the figures on the extreme inside of the dial, such as 51, 45, 40, etc., give the same information if the time required for a single operation exceeds 1 min., but is less than 2 min.

In the accompanying illustration, the


TIME AND MOTION-STUDY WATCH

watch is shown with the large black band used in time-study work stopped at 13 sec. and by referring to the outer set of figures it will be seen that the hand is opposite 275, which is the number of operations that can be performed in 1 hr., assuming that 13 sec. is required for a single one.

PNEUMATIC SPRING BANDING PRESS

THE accompanying illustration shows a pneumatic spring banding press, which has been placed on the market by Joseph T. Ryerson & Son, Chicago, with the object of enabling the smaller railroad shops throughout the country to dispense with hand work for this operation. The fact that hydraulic power is not so widely obtainable as pneumatic renders this machine particularly suitable for shops engaged in repair work and other general lines.

This banding machine is operated with 100 lbs. per sq. in. air pressure, the cylinders, which are 16 in. diameter, enabling a pressure of 60 tons to be exerted on the rams. The pressure exerted on the spring band being positive and known, work is turned out with greater uniformity and rapidity than when done by hand.


PNEUMATIC SPRING BANDING PRESS.

The simplicity of design and construction places this machine within reach of the smallest railroad shop and commercial spring manufacturing plant, which, by the adoption of suitable dies, can also produce the bands on the same machine.

Each machine is furnished complete with three-way hand-operated valves and the necessary pressure gauges. The weight of the machine as illustrated is 6,500 lbs.

TRADE OPENINGS IN BRITISH INDIA

THE following information regarding openings for trade in British India is extracted from the official review of the trade of India in the past year. The Director of Statistics to the Indian Government recently reported:—"Electrical machinery for use in connection with water-power plant has great capabilities of expansion. The total number of electrical installations in India is already large and is increasing. All the larger towns and chief ports possess electric light and electric tramways, or are about to use power for these purposes. A gradually increasing market for electrical machinery is anticipated.

In recent years the collieries of India have largely adopted electrical equipment, and here German goods have found an opening. The Calcutta market has in late years been flooded with cheap German materials for electric wiring, such as cables, switches, ceiling roses and cut-outs. Since the outbreak of hostilities this source of supply has ceased, and the United Kingdom and its colonies are likely to capture the German trade in these goods, provided the requirements of the markets are carefully studied."

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - Vice-President
H. V. TYRRELL - - - - - General Manager
PUBLISHERS OF
CANADIAN MACHINERY
AND MANUFACTURING NEWS
A weekly newspaper devoted to the machinery and manufacturing interests.
PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS, H. C. FOGARTY.
Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. MARCH 2, 1916 No. 9

SHELL PRODUCTION IN BRITAIN

IN another section of the present issue of Canadian Machinery will be found an outline description with illustrations covering one of the many specially erected and equipped munitions plants now doing business throughout the British Isles. We are indebted to our British contemporary, "Engineering," for the privilege of having the material appear in our columns.

The extent and capacity of the plant described are of direct interest to Canadian metal-working establishments engaged in shell production, inasmuch as, that from the outline data given, some idea may be got concerning the organizing forces that have been at work in bringing such institutions to their now high state of utility and proficiency. At the same time, the reason in whole or part, why munitions orders to be filled in Canada are less prolific than heretofore, may possibly be traced.

Shells, it will be noted, are being produced in these plants of all types and sizes—shrapnel and high explosive, from the smallest to the largest in service and for both British and Allied guns. Operation methods and devices and machine tool equipment installed are for obvious reasons but briefly referred to, respecting which we might say that no disappointment need be felt, as the various processes and the means of their successful accomplishment are already well-known to all of our munitions factories and have been specially featured in our editorial and advertising columns, several score times.

We appreciate the opportunity of placing the material at our readers' disposal, believing, that, by so doing, the net result will be a more realistic conception of the earnestness with which the Old Land has set itself to the task of bringing the war to its one and only logical conclusion.

WHAT IS SUITABLE SHELL STEEL?

DISCUSSIONS in contemporary journals indicate that English investigators and manufacturers are not disposed to rest satisfied with the Government's seeming indifference toward the question of suitable shell material. Up till now the War Office has successfully resisted all efforts to have shells made of other material than forged or rolled steel, meeting all arguments and proposals with the stereotyped reply that in the opinion of its advisers it would not be expedient otherwise.

Without in any way detracting from the prestige of the War Office experts or questioning in any way their knowledge of what is suitable shell steel, it might be pertinent to inquire of them what is not suitable shell steel.

The aim of Britain's munitions makers is to largely exceed Germany's reported shell output of one and three-quarter millions per week. Whether that has been done, or will be done is beside the point, but severe official specifications should not be allowed to exercise a restrictive effect on the output and prevent due consideration of other grades of material already in use by certain powers. That eminent authority, Dr. Stead, in a recent paper, discusses actual variations in German shell composition as learned by analysis of actual pieces. Where steel is required to possess great fatigue resisting properties, combined hardness and toughness, or be specially suitable for machining or drawing in presses, the importance of chemical composition is recognized because actual mechanical tests have performed the basis of comparison, and afforded physical proof of the influence of various substances.

The importance of this fact is recognized by Dr. Stead, and his position as an analytical chemist adds weight to his statements—"If a steel is proved by suitable mechanical testing to be satisfactory, on no account should it be rejected on chemical analyses. . . If the results of my mechanical tests are confirmed, then the obvious thing to do is to alter the specifications forthwith. If the mechanical tests are found to be conclusive, then it would be a national crime to reject material on any chemical specification before submitting the steel in question in the form of a finished shell to the more convincing mechanical test."

THE NEW TAXATION FOR WAR PURPOSES

ONE thing that strikes us relative to the proposed new taxation for war purposes is the absolute lack of detail concerning its operative machinery. It has all the appearance of being the result of a "throw of the dice," or at best the maiden effort of an amateur performer. Such opportunity to riddle the Budget proposal of responsible Government with shot and shell rarely presents itself, and indications are everywhere abundant that party friend and party foe will be actively militant in assailing its rawness and lack of essential qualifications.

That the money has got to be raised by some legitimate means, nobody for a moment disputes, and that all concerned realize an obligation with respect to its raising, goes without saying. The proposals submitted define a wide diversity obligation, and presume to state the cash value of each, irrespective of right or reason. The very fact that the main feature of the 1916 Canadian Budget is taxation of profits of our commerce and industry, and therefore in its every feature touching business men, should have been reason enough why some little attention and investigation should have been given the proposals so that presentation of them would have had at least a business air about it.

The whole scheme, it seems to us, is so supremely tentative, that any one of a series of developments may easily be anticipated when the House in Committee proceeds to its dissection, if enough body may meantime or then be found to it. Evidence is, however, accumulating to show that while the ideal aimed at will not fail of accomplishment, the concentration of productive effort will affect to a considerable extent the scope of the original propositions.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron.	28 00	
Ferro nickel pig iron (Soo)	25 00	
	Montreal.	**Toronto.**
Middlesboro, No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	2.75
Steel bars, 2 in. and larger, base	4.00
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	3.00
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	2.90
Structural shapes	2.90
Plates	3.15

FREIGHT RATES

Pittsburgh to Following Points. Per 100 lbs.

	C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$31 00	$30 50
Electrolytic copper	31 00	30 50
Castings, copper	30 00	30 00
Tin	48 00	56 00
Spelter	23 00	25 00
Lead	8 25	8 25
Antimony	48 00	48 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, ¼ to ½ in., lb.	$3 40	$3 25
Heads, per 100 lb.	3 65	3 45
Tank plates, 3-16 in.	3 70	3 55

WROUGHT IRON PIPE

Prices in effect Feb. 18, 1916

Buttweld

Per 100 feet	Black	Galv.
¼ and ⅜ in.	$ 2 64	$ 4 41
½ in.	3 32	5 14
¾ in.	3 91	6 38
1 in.	5 78	9 44
1¼ in.	7 82	12 77
1½ in.	9 35	15 26
2 in.	12 58	20 54
2½ in.	19 89	32 47
3 in.	26 01	42 46
3½ in.	31 28	51 06
4 in.	37 06	60 50

Lapweld

2 in.	14 06	22 02
2½ in.	20 48	35 05
3 in.	26 78	43 22
3½ in.	32 20	51 98
4 in.	38 15	61 59
4½ in.	48 26	75 57
5 in.	56 24	88 06
6 in.	72 96	114 24
7 in.	99 96	153 50
8 in x 25 lbs. per ft.	105 00	161 25
8 in.x28 lbs. per ft.	120 96	185 76
9 in.	144 90	222 53
10 in.x32 lbs. per ft.	134 40	206 40
10 in.x40 lbs. per ft.	173 04	265 74

Ontario list—All points from Kingston and west to, but not including Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
¼ in. and ⅜ in.	$ 2 58	$ 4 35
½ in.	3 23	5 06
¾ in.	3 80	6 27
1 in.	5 61	9 27
1¼ in.	7 59	12 54
1½ in.	9 08	14 99
2 in.	12 21	20 17
2½ in.	19 31	31 88
3 in.	25 25	41 69
3½ in.	30 36	50 14
4 in.	35 97	59 41

Lapweld

2 in.	13 69	21 65
2½ in.	19 89	32 47
3 in.	26 01	42 46
3½ in.	31 28	51 06
4 in.	37 06	60 50
4½ in.	46 99	74 30
5 in.	54 76	86 58
6 in.	71 04	112 32
7 in.	97 58	151 13
8 in. x 25 lbs. per ft.	102 50	158 75
8 in. x 28 lbs. per ft.	118 08	182 88
9 in.	141 45	219 08
10 in. x 32 lbs. per ft.	131 20	203 20
10 in. x 40 lbs. per ft.	168 92	261 62

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 75	$17 75
Copper, crucible	21 00	21 00
Copper, unch-bled, heavy	20 75	20 75
Copper wire, unch-bled	20 75	20 75
No. 1 machine compos'n	16 25	16 25
No. 1 compos'n turnings	13 50	13 50
New brass clippings	13 50	13 50
No. 1 brass turnings	11 25	11 25
Heavy melting steel	9 00	10 00
Boiler plate	11.75	19.00
Axles, steel	13.00	15.00
Axles, wrought iron	18.00	19.00
Tires, steel	11.75	10.50
Rails	13.00	13.00
Shafting	15.00	16.00
Malleable scrap	10.00	12.00
Pipe, wrought iron	8.50	9.00
Stove plate	8.50	8.50
No. 1 wrought iron	11 75	11 00
No. 1 machin'y cast iron	14 75	14 00
Heavy lead	6 00	6 00
Tea lead	5 00	5 00
Scrap zinc	15 50	15 50
Aluminum	34 00	34 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	60
Stove bolts	75
Plate washers	35
Machine bolts, ⅜ and less	52½
Machine bolts, 7-16 and over	42½
Blank bolts	42½
Bolt ends	42½
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12½
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hexagon, all sizes	2¾c per lb. off
Nuts, hexagon, all sizes	3c per lb. off
Copper rivets and burrs, list plus	15
Burrs only, list plus	30
Iron rivets	60
Boiler rivets, base, ¾-in. and larger	$4.35
Structural rivets, as above	4.10
Wood screws, flathead, bright	85
Wood screws, flathead, brass	50
Wood screws, flathead, bronze	45

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh....	$35 00
Open-hearth billets, Pittsburgh.	35 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	50 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 20	$3 15
Cut nails	3 15	3 20
Miscellaneous wire nails..	75 per cent.	
Pressed spikes, 5/8 diam., 100 lbs.	$3 75	

MISCELLANEOUS

Solder, guaranteed	0.30
Solder, strictly	0.28
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.37
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	11.70
Red dry lead, 100-lb. kegs, per cwt.	11.50
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll ...	0.95
Motor gasoline, single bbls., gal. ..	0.30½
Benzine, single bbls., per gal.	.030
Pure turpentine, single bbls.	0.78
Linseed oil, raw, single bbls.	1.02
Linseed oil, boiled, single bbls.	1.05
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs...	6.00
Lead Wool, per lb.	0.11
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto	25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	55
Standard drills over 1½ in.	30
3-fluted drills to 1½ in.	30
3-fluted drills over 1½ in.	20
Bit stock	65
Ratchet drills	30
Machine bits for wood	30 and 5
S.S. drills for wood	55
Wood boring brace drills	40
Electricians	35
Sockets	55
Sleeves	55
Taper pin and taper reamers	25
"Premier" and "Leader" chucks..	10
Arbors for above	10
Drills and countersinks	5
Bridge reamers	55
Centre reamers	15
Chucking reamers	15
Hand reamers	15 and 5

High speed drills and reamers are double the list price plus 20 per cent.

COLD ROLLED SHAFTING

At mill	10%
At warehouse	Net

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$3 75
Canada plates, dull, 52 sheets	4 50	4 00
Canada Plates, all bright	6 30	5 25
Apollo brand, 10¾ oz. galvanized	6 75	6 75
Queen's Head, 28 B.W.G.	7 25	7 25
Fleur-de-Lis, 28 B.W.G. ..	7 00	7 00
Gorbal's Best, No. 28	7 25	7 25
Viking metal, No. 28 ...	7 00	7 00
Colborne Crown, No. 28 ..	6 75	6 75
Premier, No. 28, U.S. ..	6 65	6 15
Premier, 10¾ oz.	6 90	6 80

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.55
⅜ in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
⅝ in.	6.35
¾ in.	6.15
⅞ in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B B

⅛ in.	$14.00
3-16 in.	10.45
¼ in.	7.15
5-16 in.	5.65
⅜ in.	4.60
7-16 in.	4.60
½ in.	4.60
⅝ in.	4.45
¾ in.	4.45

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	72½
Kearney & Foot, Arcade	72½
J. Barton Smith, Eagle	72½
McClelland, Globe	72½
Black Diamond	72½
Delta Files	72½
Nicholson	72½
Globe	72½
Vulcan	70-10
Disston	70

BOILER TUBES

Size	Seamless	Lapwelded
1 in.	$18 70	......
1¼ in.	18 70	......
1½ in.	18 70	12 70
1¾ in.	22 00	12 70
2 in.	22 00	12 10
2¼ in.	24 20	13 30
2½ in.	26 40	15 95
3 in.	35 20	16 06
3½ in.	38 50	19 80
4 in.	44 00	25 30

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.44
Royalite, per gal.	.13½
Machine oil, per gal...........	.23
Black oil, per gal.	.13½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	.04¾
Lard oil, per gal.	1.28
Thread cutting oil	.54
Imperial quenching oil	.38
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.....	$ 7.25
Galvanized, 24 wires, 1 in.......	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in...........	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble,	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft. ...	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft. ..	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal...	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.15¼
Peerless	.15¼
Grand	.14¼
X L C R	.13¼
Atlas	.13¼
X Empire	.12¼
X press	.11¼
COLORED.	
Lion	.09½
Standard	.08¾
No. 1	.08¾
Popular	.07¾
Keen	.06¾
WOOL PACKING.	
Arrow	.20
Axle	.15
Anvil	.11
Anchor	.09
WASHED WIPERS.	
Select White	.09
Mixed Colored	.07
Dark Colored	.05½

This list subject to trade discount for quantity.

COPPER SHEETS

	Montreal	Toronto
Bars, ½ to 2 in.	$41 00	$40 00
Plain sheets. 14 oz., 14 x 28 in., 14 x 60 in..	44 00	43 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	45 00
Copper sheet, planished, 14 x 60 base	54 50	53 00
Braziers' in sheets, 6 x 4 base	43 00	42 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 00	$10 00
Sheets, 3½ lbs. sq. ft..	9 00	9 75
Sheets, 4 to 6 lbs. sq. ft.	9 75	9 75

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.32 to .33
Tin	.48 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs	.07 to .08
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy	.35
Copper sulphate	.22
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)..	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., Feb. 28, 1916.—The industrial situation continues to show an upward tendency, but although the limit would seem to be within reach, there is nothing to indicate just when such a condition will come about or how much higher present prices will rise.

One of the chief influencing factors of the present situation is the shortage of ocean vessels. Owing to the extreme scarcity of ship plates it has become almost impossible to construct vessels of sufficient tonnage to begin to meet demands. Wooden shipbuilding has consequently received new impetus, and considerable activity is now going on in the shipbuilding yards of Nova Scotia. Vessels in course of construction there are being fitted with steam auxiliaries, and it is hoped these will assist to some extent in relieving the conditions due to the present scarcity of shipping.

Pig Iron

The situation in pig iron remains unchanged. Producers of steel-making pig continue to work at high pressure, in an effort to keep up with the demands of the steel mills. Difficulty is being experienced in the transportation of raw materials owing to car shortage. However, this is now being relieved, and it is expected that improved facilities in this connection will continue. Coke producers are experiencing some trouble in securing men to operate the furnaces, and in some respects are spending considerable money in obtaining suitable help.

Steel

With the demand for all classes of steel as great as ever, the steel trade continues working at great pressure, in an effort to supply the requirements of the abnormal market, which will, in all probability, continue throughout the present year and well into 1917. The trade in railway material is increasing, and inquiries for 1917 rails have recently been noted, but while no large developments are reported, the price of rails, which has not been advanced, seems very low when compared with those of other steel products. Owing to the advance, a few days ago, of $5 a ton on bars, plates and shapes, it is expected that Montreal prices—in lines affected—will follow those of the United States market. However, local dealers have not yet decided on an advance, but it is intimated that prices may change before the week end.

The demand for plates is exceedingly heavy, and it is practically impossible to meet the requirements for shipbuilding plates. Local quotations show an advance of $8 a ton on plates ¼ to ½, and $9 a ton on heads and 3-16 inch tank plates, the respective prices being $3.40, $3.65 and $3.70 per 100 pounds.

The demand for galvanized sheets continues light and no advance is quoted, but dealers are firm on present prices. The demand for blue annealed sheets is very heavy, and producers are taxed to the utmost in supplying the needs of the trade. Canada plates, dull, are now quoted at $4.50, and all bright at $6.30. Premier No. 28 U. S. galvanized is now $6.65.

Following the expected advance in proof coil chain, local dealers are now asking the prices shown on the selected quotation pages, which is an increase of from about 6 per cent. on ¼-inch to 20 per cent. on 1-inch chain. In view of the existing conditions prevailing, it would not be surprising to see further advances in many lines of steel products.

Metals

The tone of the general market is somewhat easier, but conditions are apparently unchanged. Copper, which has been constantly rising for some time, is, seemingly, quietening down, but it is unlikely that the lull will lapse into a weaker market, as the demand shows no signs of abatement. Without any apparent reason foreign tin markets have taken on considerable strength. Some difficulty is still experienced by shippers in the securing of permits to ship tin. Lead has shown strength with an advance in price. The better grades of spelter are demanding higher prices.

Copper.—The week has passed without any features of exceptional interest having developed in the copper situation, which has been on the whole a quiet market and comparatively void of speculation. Few prompt or early deliveries are reported, and most of the current business is for June and later delivery. Some manufacturers, whose contracts with producers have nearly expired, are experiencing great difficulty in placing further orders, which is causing much uneasiness, as consumers are dealing where supply is available.

The unsettled condition of the political situation across the line is keeping buyers from heavy future purchase, and it is generally supposed that the copper market has about reached its height, for the present; but it is not expected that any great decline will be noted for many months. Local dealers report an advance of ½c per pound, Lake being quoted at 31c, electrolytic 31c, and castings 30c per pound.

Tin.—The situation in the tin market has taken on considerable strength during the past week. Advices from London report continuous advances, but no specific reasons are given, with the exception that buyers are anxious to secure metal, while the sellers are apparently few. The recent advances cannot be traced to any developments on the American market, which has of late been comparatively quiet. It is possible that the report of no available tin for early delivery has stimulated the British market with the resultant advance quoted, which is on an average of £2 per ton.

As there is no indication of any reduction in the Eastern output, it is assumed that the present available supply has been sold to consumers, and it is more than likely that the recent advance will be of short duration. In the wake of the foreign market the local dealers are quoting an advance of 1½c a pound, this week's price being 48c.

Spelter.—Further advances are noted in foreign markets. London reports an extra £2 on spot spelter, but future prices are somewhat lower than recently quoted. However, this foreign movement has not yet affected the markets here, which are little revived from the past week's dullness. Little improvement is shown in the demand for spelter, and no great amount of business is being transacted with the exception of such export trade as has previously been contracted for. The general dullness is largely due to the reduced activity in copper, and it is anticipated that quiet may prevail for some little time. The supply of high-grade metal is now apparently greater than the demand, and various lots have lately been offered for resale. Early and spot delivery on intermediate and brass specials are hard to obtain, and it is only on May or later that producers will guarantee delivery.

Local conditions remain unchanged, with prices firm at 23c per pound.

Lead.—Recent inquiries for spot metal have materially strengthened the market, and the prospects are that early advances may be quoted. Efforts are being put forth to prevent any sharp rise in the price of lead, and although the occasion has arisen several times, the Trust has eventually succeeded in stopping any unnecessary increase.

The supply at present is not any too great for the requirements of the trade, and it is not expected that any weakness will develop for some time. The lack of ocean tonnage is also a serious feature at the present time, and until some solution is arrived at in this connection, no permanent relief can be looked for.

Local business is reported fair, with a slight advance over last week's quotation. An increase of ¼c puts the price up to 8¼c per pound.

Antimony.—The evident scarcity of visible metal has resulted in a stronger market, and New York is quoting an advance of ½c. Munition makers have been large purchasers recently, and in the face of the present shortage, dealers abroad are asking higher prices. However, the situation here is weaker, but the demand is good. Quotations are easier this week at 48 cents per pound.

Aluminum.—A fair demand for immediate shipment is keeping the market firm, and inquiries for future are good. Prices here show a decline of 1c a pound. Present quotation 68c.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Machine Tools and Supplies

The inquiries for machine tools, especially requirements of munition manufactures, are quite brisk, but the general demand is not as active as a few months back. However, the strength of the domestic market seems to be improving, and additions to plants, to meet the changing conditions, are continually being reported. This is more evident in certain sections of the United States, where machine tool construction predominates. The trade in second-hand machinery is very active at present. The pressure at which many of the munition plants are working maintains a constant drain on all available machine tool supplies. The manufacturers of high-speed steel, drills, taps, reamers, lathe chucks and all special attachments, find their capacity unequal to the demands made upon them, and are unable in many respects to supply a customer with his complete requirements.

Old Materials

The trade in scrap metals has not been very active for the past few days. In view of the continual advance in the price of finished steel, scrap dealers are looking forward to better prices in heavy melting steel and the like. Coppers have advanced ¼c per pound; brass clippings and turnings are up ¼c, and scrap zinc shows an advance of ½c per pound.

Toronto, Ont., Feb. 29.—Trade generally continues in a satisfactory condition the volume of business passing being greater than that for the corresponding period of last year and quite up to expectations. The remarkable expansion in trade is shown in the returns recently issued by the Customs Department. The exports for the first ten months of the fiscal year increased by nearly 80 per cent. as compared with the preceeding ten months while the imports increased by about 15-million dollars for the same period. Exports of manufactured goods for the ten months under review totalled $100,000,000 being an increase of $105,000,000, due of course, mainly to war orders. The local teamster's strike has been settled and the congestion of freight at the railway terminals is being rapidly relieved. The embargo which the railways placed on many classes of shipments consigned to Toronto, has been lifted and conditions are practically normal.

Prices of all steel and ingot metal products are very firm and changes continue in an upward direction. The increasing scarcity of raw materials of various kinds is becoming a serious matter as it is forcing up prices of finished products and at the same time is threatening to cause a shortage of many lines. The extraordinary demand for steel is, of course, affecting all steel products and prices are steadily advancing. Prices of ingot metals have been going up steadily for the past two or three weeks but there are indications that the top of the market has been reached. The present high price of cordage is due to the shortage of fibre and abnormal ocean freight charges. The crude oil situation shows no improvement and prices of gasoline and benzine continue to advance. A new list of discounts on bolts and nuts has been issued.

Steel Market

The market is as strong as ever and prices are very firm with an upward tendency. The demand for steel continues unprecedented and the outlook for the industry could hardly be better. Prices of domestic steel bars, plates and shapes are unchanged at $2.75 but the recent sharp advance in the United States market may affect the local market and result in higher prices here. Prices of boiler plates and tubes are very firm and will be higher in the near future, the demand in the primary markets being very heavy. Makers of boiler

tubes report that they are sold up for six months. Makers of wire rods are quoting $50 to regular customers for deferred deliveries, but rods are very scarce and a compaatively small tonnage is being sold in the open market. Prices of bolts and nuts have advanced about 5 per cent., the new discounts are given in the selected market quotations. Rivets have also advanced, boiler rivets being quoted at $4.35 and structural rivets at $4.10. The galvanized sheet market is very strong and higher prices are looked for in the near future. The recent advance in the price of spelter will tend to further reduce the output of galvanized sheets and also increase prices.

The recent advance of $5 a ton at Pittsburgh on contract bars, plates and shapes was apparently quite unexpected and has disturbed the market. Bars are now quoted at 2.50c, plates 2.75c, shapes 2.25c, and hoops 2.50c, Pittsburgh. Specifications against contracts for rolled steel products are being received by the mills in overwhelming volume. New business offered also is of large proportions, but there is some hesitancy in accepting contracts offered even for delivery during the last quarter of the year. The further advance has not checked buying, and consumers are placing all the business that the mills will accept. Chicago warehouse prices have advanced again, bars and shapes being now quoted at $2.90 and plates at $3.15. Bessemer billets have again advanced and are now quoted at $35 a ton Pittsburgh. Open-hearth and forging billets are unchanged at $35 and $55 per ton, Pittsburgh, respectively. The uncertainty of the future market for ferro-manganese is causing considerable anxiety among steel producers as it is not known how much will be available for the second half of the year. Spot and early delivery ferro-manganese continues to command very high prices, spot being quoted at $225 to $250, and early delivery well over $180 seaboard.

Pig Iron

The situation is unchanged and the market fairly active. The heavy demand for steel making grades continues and there is an improvement in demand for foundry iron. Quotations are firm and unchanged.

Machine Tools

The situation is unchanged and the market is quiet. As the majority of munitions plants are now well equipped, the demand for machine tools has fallen off considerably, although some nice business is being done in special tools for machining shell parts. A local shell making concern recently put on the market a considerable quantity of machinery which it is understood sold well. Disquieting reports come from New England regarding labour troubles at several plants. If the unrest spreads, machine tools builders in that district, doing business in Canada, may be affected.

Supplies

The market continues very firm and prices are higher for some lines of supplies. New and lower discounts have been issued for globe valves, etc. Globe, angle and check valves, brass body, are now quoted at 30 per cent., off, but the same lines with iron bodies are 45 per cent., brass gate valves 30 and 5 per cent., and iron gate valves at 60 per cent. off list. White lead advanced 25c and is now quoted at $11.70 per 100 lbs. in ton lots. Gasoline and benzine are up again being quoted at 30½c and 30c per gallon respectively. The oil market is very strong, all grades of Pennsylvania crude having advanced 5c per barrel recently, bringing Pennsylvania crude up to $2.40. A heavier consumption of gasoline will begin shortly as the weather improves and prices will no doubt go still higher. Castor oil has also advanced and is now being quoted at 44c per lb. Thus is due to the serious shortage and difficulty in obtaining supplies from England. Oakum is higher at 6c per pound. The turpentine market is very weak and quotations have fallen to 78c per gallon. Linseed oil is firmer and unchanged.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

Metals

The metal markets are very strong and prices continue to advance. The upward movement is not quite so strong, and the top of the market has probably been nearly reached in the meantime. Copper has halted and the market is now generally sold out through May, while some producers claim to be sold up through June. Tin is higher on account of continued strength in the primary market. Spelter is also higher due to an advance in London caused by a scarcity of spot metal. The lead market is very strong, a tight situation for spot metal having developed. Antimony has advanced and the market is very firm with a continued scarcity of nearby metal. There is a continued scarcity of spot aluminum and the market is very strong but unchanged.

Copper.—The upward movement has apparently stopped but the market is very strong and the situation unchanged. Buyers are reported to be well supplied for immediate needs and not inclined to increase their future purchases unless consuming requirements are affected. The position of copper is a sound one and the present price although high is due entirely to actual supply and demand. It is therefore highly probable that the present level will be maintained for some time to come. Quotations are unchanged and nominal at 30½c per pound.

Tin.—The local market is higher due to continued advance in London. The reason for the movement in London is not clear but some importers claim that it is on account of difficulties in obtaining permits, and that there is very little metal for delivery in the next two or three months, for sale. Tin has advanced 1c and is quoted locally at 48c per pound.

Spelter.—Spelter is higher following an advance in the London although the New York market is dull and easy. The demand for spelter from the brass mills continues heavy but the price is too high to interest the galvanizing trade. Spelter has advanced 1c and is now quoted locally at 25c per pound.

Lead.—Prices are unchanged at the "Trust" price of 6.30c New York, but higher in the outside market. The market has an upward tendency and higher prices appear probable, as a tight situation for spot lead has developed in New York. Local quotations are firm at 8¼ per pound.

Antimony.—The market is firm and higher with quotations practically nominal. There are still no large offerings of antimony for any earlier position than March shipment, and all spot metal has been contracted for. Antimony has advanced 1c and quotations are nominal at 48c per pound.

Aluminum.—There is no improvement in the situation. The demand is heavy but supplies are scarce and prices nominal. Quotations are unchanged locally at 68c per pound.

Solders. — Quotations are unchanged at last week's level but the market is firm and higher prices may develop in

the near future guaranteed solder is quoted at 30c per pound.

Scrap

The strength in the scrap copper market has been well maintained and prices are a little higher. There is a good demand for copper but the advance is due largely to the situation in the copper market. Scrap zinc is also higher in sympathy with the upward movement of spelter. Heavy melting steel scrap is in good demand but prices are unchanged. The scrap market has been rather more active lately, although the general situation shows little change.

Tin Higher.—A sharp advance in the tin market is reported as we go to press due probably to the market being disturbed over the possibility of cargoes of tin being lost through submarine attacks. Tin is now quoted at 56c per pound, being an advance of 9c. All solders are correspondingly higher.

Winnipeg, Man., Feb. 26.—Fear is expressed here that the labor scarcity, which is probably more acute in the West than anywhere else in Canada, is liable to have its effect on the machinery market. Scarcity of labor is also blamed for any lack of confidence there is, and consequent disinclination to spend money. The past month has been remarkable for the large number of saw mills which have resumed operations all over the West, this resulting in an almost unprecedented demand for supplies. There is a healthy tone to the lumber industry, and business should be fairly good throughout the year.

The supply trade, which has been exceptionally good during the past two months, is still the best department as far as machinery markets are concerned. Little is heard here now regarding shell contracts, although it is rumored that a number of firms have got further work to do; the conditions under which contracts were placed has not, however, been made public.

Announcement was made last week to the effect that the Manitoba Steel Foundries have been incorporated, and that they would instal an electric furnace at Selkirk for this purpose. It is understood that the products will be used by the Manitoba Rolling Mills, which is the parent concern.

The metal markets during the past week have shown very little change, the principal items affected being nails, wire and galvanized sheets. A revised price has been issued on cut nails, base now being $4 per keg. Planished copper shows a slight advance, and current prices on 14 and 16 oz. is 44c per pound. It is understood here that there is liable to be a shortage of Canada plate, and considerable buying is taking place by those who wish to protect themselves.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Swift Current, Sask.—The Winnipeg Oil Co. propose building a distribution plant here.

Stratford, Ont. — The R. M. Ballantyne Co. propose to make an addition to their power plant.

Shawinigan Falls, Que.—The Belgo-Canadian Pulp & Paper Co. will build an addition to their plant here.

Guelph, Ont.—Alex. Callander will build a foundry here, 50 ft. x 100 ft. The capital involved is about $8,000.

Port Sidney, Ont.—S. Smith is in the market for a marine engine, fore and aft, 6 x 10 or 12 x 9 in., with condenser.

Guelph, Ont.—The Louden Machine Co. purposes making an extension to its factory. Estimated cost, $15,000 and $20,000.

Portneuf, Que.—The Portneuf Hydro-Electric Co. will instal a 50 h.p. water turbine and generator at their power plant here.

Vancouver, B.C.—Pumps & Power, Ltd., 224 Abbott Street, is in the market for a 15-h.p., three-phase motor, also a 5 to 10-h.p. steam engine.

Toronto, Ont.—White & Thomas, 212 Simcoe Street, are building an addition to their plant for the manufacture of galvanized iron products.

Toronto, Ont.—The Harris Abattoir have received permission to make an addition to their engine room on St. Clair Avenue at a cost of $7,000.

Fredericton, N.B.—The Fredericton Gas Light Co .has been taken over by a new syndicate, who will probably make extensions to the plant in the near future.

Sault Ste. Marie, Ont.—The Algoma Steel Corporation will erect a new building, 120 x 350 feet, at a cost of $50,000. The McPhail & Wright Construction Co. are the contractors.

Niagara Falls, Ont.—The Canadian Niagara Power Co. will enlarge its forebay and add several generating units. The work will cost $2,000,000. Philip P. Barton is general manager.

Kincardine, Ont. — The Ontario People's Salt & Soda Co. will receive bids until April 1 for the erection of an addition to its plant to cost about $15,000. John Tolmie is manager.

Hamilton, Ont.—The United Gas & Fuel Co. have purchased a site on Stripes' Inlet, where coke ovens will be built. Plans are being prepared for a plant which will cost about $2,000,000.

Granby, Que.—The F. S. Carr Rubber Co. has taken over the old factory of the Walpole Rubber Co. here, and is installing a complete power system, including steam boilers, engines, generators, etc.

Little Bras D'Or, N.S.—The colliery engine house, briquette plant and mine head, owned by the Colonial Mine Co., have been totally destroyed by fire. Loss is estimated at $50,000. Manager, G. B. Burchell.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attaché, Room 904 Flat Iron Building, New York City.

Montreal, Que.—Fire caused $30,000 damage to the forge department of the Turcot plant of the Canada Car & Foundry Co., with a loss of about $60,000. The plant will be rebuilt at once.

Shawinigan Falls, Que.—The Canadian Electrode Co., a subsidiary of the Shawinigan Water & Power Co., Montreal, is erecting a large plant here, for the manufacture of carbon electrodes, etc.

Weedon, Que.—The Weedon Chemical Co. is rebuilding its plant, which was recently destroyed by fire with a loss of $60,000. The company will also build another factory, for which it is now looking for a site.

Windsor, Ont.—Plans are being prepared by A. R. Bartlet, of this town, for the erection of a factory at Windsor or Walkerville, Ont., for the Chalmers Motor Co., Detroit, Mich., to cost $65,000.

Chatham, Ont.—The American Well Works Co., of Aurora, Ill., have started putting the local plant into shape for manufacturing operations. The company make well drilling outfits and pumping machinery. F. J. Lukins will be manager of the Canadian branch.

Vancouver, B.C.—The Dominion Government has approved the plans of the Amalgamated Dry Dock & Engineering Co., which will build a drydock and shipbuilding plant on the North shore. It will include a graving dock, buildings, marine railway and equipment, etc. J. L. Davidson is manager.

Niagara Falls, Ont.—The Ontario Power Co. will install two additional units at its plant, and will increase its generating capacity to 180,000 h.p. It will also construct a pipe line 6,000 ft. long by 18 ft. diameter to supply the units. Construction work will be started in the spring, and will cost about $3,000,000. B. G. Converse is manager.

Sarnia, Ont.—The manufacturing interests of Sarnia who use the power of the local electric company for operating their plants are opposing the action of the Hydro Commission, which proposes to install 25-cycle power when the new hydro-electric scheme goes through. Sixty-cycle motors are at present installed throughout the city.

General Industrial

Alvinston, Ont.—The Board of Trade are endeavoring to establish a sugar beet factory here.

Fort William, Ont.—Three firms are looking into the possibility of building elevators here.

Quebec, Que.—The G. A. Vaudry Biscuit Co. factory was recently destroyed by fire, the loss being estimated at $40,000.

Niagara Falls, Ont.—The Pollard Mfg. Co. have purchased a controlling interest in the Dominion Safe & Vault Co., of Farnham, Que., and will remove the plant to Niagara Falls. The Pollard Co. will make the "Midget" flour mill.

North Vancouver, B.C.—The Vancouver Creosoting Co. are building a factory here. Some contracts have been awarded.

Sackville, N.B.—The A. E. Wry-Standard, Ltd., are rebuilding their boot and shoe factory, which was recently destroyed by fire.

Fort Erie, Ont.—The directors of the International Safe Co. at a meeting held here recently decided to build an addition to the plant, which will double the capacity.

Stratford, Ont.—The addition which the Avon Knitting Co. propose building to their factory will be 36 ft. by 60 ft. and three storeys high. Thos. Hepburn is the architect.

Brampton, Ont.—The council have under consideration a proposal to establish a rubber and tire factory here. Frank D. Law is interested in the scheme. A by-law will be voted on.

Chatham, Ont.—The C. & W. Shoe Co., of London, Ont., propose moving their business to Chatham, providing the by-law carries on March 6. The company propose taking over part of the Wolverine Brass Works, now vacant. Edward Hunt, of London, is interested.

Quebec, Que.—It is reported that the Dominion Textile Co., which already has two large mills at Montmorency Falls, will shortly erect another large plant close to the Riverside Mill. The two plants already in existence have been working night and day for some months past, but it is understood that the lines to be manufactured in the proposed new plant will be different from those now turned out at the existing plants.

Toronto, Ont.—The W. K. Kellogg Cereal Co. has purchased the Central Prison broom factory, and work has started on rebuilding the premises. $125,000 worth of new machinery will be installed at once.

Tenders

Toronto, Ont.—Tenders will be received up to Tuesday, March 7, 1916, for furnishing and constructing radial brick chimney and foundations for the refuse incinerating plant on Don Roadway. Specifications and forms of tender may be obtained from the office of the Street Commissioner, City Hall.

Toronto, Ont.—Tenders addressed to the Secretary-Treasurer, Board of Education, will be received until Wednesday, March 8, 1916, for science class electrical equipment for Humberside Collegiate Science Department. Specifications may be seen and all information obtained at the office of the Clerk of Supplies, City Hall.

Toronto, Ont.—Tenders will be received by the Chairman, Board of Control, City Hall, up to Tuesday, March 14, 1916, for the supply and delivery of: One single-truck, double-end street car, completely equipped; one car body, double-end, single-truck; equipment for one single-truck; equipment for one single-truck car. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont.—Tenders will be received by the Chairman, Board of Control, City Hall, up to Tuesday, March 14, 1916, for the supply and delivery of: Special track work, for St. Clair Avenue barn; extension, Toronto Civic Railway. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Drummondville, Que.—Tenders will be received until March 15, 1916, for the supply of materials and the construction of a pumping station and mechanical gravity filters. Those interested can obtain specifications and plans covering said works at the office of the town clerk, W. A. Moisan, and also at the office of M. M. Ouimet & Lesage, 76 St. Gabriel Street, Montreal, P.Q.

Municipal

Brantford, Ont.—The council may purchase motor equipment for the fire department.

Weyburn, Sask.—The city will instal an additional unit at its power plant, to cost $35,000.

Waterloo, Ont.—The Town Council will buy a motor truck for the Water and Light Commission.

Quebec, Que.—George A. Johnson, consulting engineer, of New York, has reported to the City Council in favor of the installation of a chlorination plant as a means of improving the quality of the water. A filtration plant will probably be installed later.

EQUIPMENT FOR AUSTRALIAN NAVAL DOCKYARD

Tender forms and specifications have been forwarded by D. H. Ross, Trade Commissioner, Melbourne, for 43 machines of various types required for the equipment of the Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W. Tenders will be received, subject to the conditions specified, up to May 1, 1916, addressed to the Director of Navy Contracts, Melbourne, Australia. The last mail in time to reach Melbourne on May 1 is that leaving San Francisco on March 22 and due at Melbourne on April 12. The tender forms are open to the inspection of Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer file No. A-1435). Particulars of the requirements are briefly outlined thus:

Three 50-ton overhead travelling cranes.

One 25-ton overhead travelling crane.

Two 5-ton overhead travelling cranes.

One 10-ton revolving cantilever crane.

Two 5-ton travelling portal jib cranes.

Two 7½-ton jib cranes.

One 5-ton jib crane.

Two 15-ton hydraulic cranes.

One 6-ton hydraulic crane.

One 6-ton wall crane (hydraulic).

Two 3-ton wall cranes (hydraulic).

Two electric passenger elevators.

Two electric goods elevators.

One 2½-ton gauge locomotive with crane attached.

One 2½-ton gauge locomotive without crane attached.

Three electrically-driven air compressors, 1,500 cu. ft.

One 15-ton hydraulic winch.

One 5-ton hydraulic winch.

Nine 10-ton hydraulic capstans.

Two 5-ton hydraulic capstans.

One bar shearing machine.

One double-ended horizontal punching machine.

One 10-ton overhead travelling crane for shipyard fitting shop.

Kingston, Ont.—The City Council have decided to instal a motor-driven blower at the incinerator plant.

Grand Valley, Ont.—A by-law to authorize the installation of a hydro-electric system will be submitted to the ratepayers on March 14.

Petrolia, Ont.—The Town Council have let the contract for equipment for the transformer station to the Canadian Westinghouse Co., Hamilton, Ont.

London, Ont.—The city will make extensive additions to its storm sewer system, to cost $160,000. Chipman & Power, Toronto, are the engineers.

Sarnia, Ont.—The City Council have engaged two expert engineers to examine the waterworks system and report on the possibilities of obtaining the required amount of water.

Trade Gossip

The Russell Motor Car Co. have removed their city sales office from 100 Richmond Street West to 276 King Street West, Toronto.

North Bay, Ont.—The Board of Trade has appointed the officers for the year 1916: President, G. A. McGaughey; vice-president, R. L. Dudley; treasurer, B. M. Mulligan.

Hamilton, Ont.—The Harbor Commission is preparing an industrial area on the water front. The land will be used for industrial sites, and railway switches will be laid down.

Collingwood, Ont.—The Board of Trade has elected the following officers: President, D. L. Darroch; vice-president, F. F. Telfer; secretary, C. T. Stephens; treasurer, D. Williams.

Moose Jaw, Sask.—At a meeting of the Board of Trade the officers elected for the year were: President, John Crawford; vice-president, W. F. MacBean; secretary, E. J. McMillan.

Sackville, N.B.—The Board of Trade has elected the following officers for the ensuing year: President, F. A. Fisher; vice-president, George E. Ford; secretary-treasurer, A. H. McCready.

The Goldie & McCulloch Co., of Galt, Ont., have presented a complete set of instruments to the 111th South Waterloo Battalion for the brass band. The instruments will cost about $1,300.

Saskatoon, Sask.—At a meeting of the Board of Trade, held recently, Malcolm Isbister was elected president for the ninth year in succession; P. Kirkpatrick is vice-president, and A. F. Lenon, treasurer.

The Petrolia Wagon Co., Petrolia, Ont., has received an order from the Dominion Government for 150 heavy transport wagons for use at the front. The value of this order is about $20,000.

Medicine Hat, Alta.—At the annual meeting of the Board of Trade, held recently, the following officers were elected: President, William Rutherford; vice-president, S. T. Hopper; secretary, S. E. McClellan.

Smith's Falls, Ont.—The following officers have been elected by the Board of Trade: Hon. president, Hon. F. T. Frost; president, H. B. Wilson; vice-president, F. W. Banby; secretary-treasurer, Dr. McCallum.

Cornwall, Ont.—The Board of Trade officers recently elected are as follows: President, A. E. Currie, manager of the Bank of Commerce; vice-president, John A. Chisholm; secretary, J. C. Alguire; treasurer, E. O'Callaghan.

The Hare Engineering Co., builders of rolling mill machinery, steel heating furnaces and mechanical stokers, are moving to offices at their new shop, 99-101 King Street West, Toronto, Ont., where enlarged facilities have been provided.

St. Catharines, Ont.—An American firm has opened a plant here for reducing potash from wood ashes. It is altogether likely that in a short while the feldspar from the Frontenac mines, near Kingston, will be shipped to the plant for the same purpose.

Sarnia, Ont.—The following officers of the Board of Trade have been elected: Honorary president, Chester Beldon, president, W. T. Goodison; first vice-president, Harry Neal; second vice-president, W. H. Kenny; treasurer, J. L. Buckan; secretary, T. A. Gordon.

Dominion Wire Rope Co.—The following officers and directors were elected at the annual meeting of the Dominion Wire Rope Co.: F. W. Fairman, president; F. H. Hopkins, vice-president and general manager; J. C. Riddell, secretary-treasurer; George P. Butters, E. E. Fairman, and Dr. C. W. Colby.

Chatham, Ont.—The Board of Trade will shortly ask the Dominion Government to undertake the dredging of the Thames River from Windsor to Chatham to permit of lake steamers navigating the river. The manufacturers of the city are strong in favor of the proposal, as a big saving in freight rates would result.

Port Dalhousie, Ont.—The Port Dalhousie Electric Light Commission has adopted a new schedule of rates as follows:—Six cents per k.w.h. for the first 30 hours' use per month of connected load; three cents per k.w.h. for the next 70 hours' use per month of connected load; six-tenths cents per k.w.h. for all consumption per month over the first one hundred hours' use of connected load.

Vancouver, B.C.—Reports are current here that two large syndicates in the East are to send engineers to the Coast to inquire into the iron ore deposits and the opportunities which exist in respect to water power, etc., with the idea of putting up a modern steel producing plant. A sufficient amount of ore is thought to be available for the purposes of the new industry in the iron ore deposits on the Mainland and on Vancouver Island.

Vancouver, B.C.—Thomas Meredith, of New Westminster, managing director of the Canadian Pacific Lumber Co., has leased the company's mill at Port Alberni to Seattle millmen. The deal involves the transfer of 250,000,000 feet of fir and cedar logs. H. A. Dent, of the Dent Lumber & Shingle Co., and A. W. Mylroi, of the Anchor Supply Co., both Seattle concerns, are the lessees and purchasers.

C. N. E. Officers Elected.—The following is the result of the election of officers of the Canadian National Exhibition, which was unanimous in every case: Hon. president, Joseph Oliver; president, Hon. Lieut.-Col. Noel Marshall; first vice-president, George Booth; second vice-president, T. A. Russell; executive committee, Mayor Church, W. K. McNaught, C.M.G.; W. K. George, Robt. Fleming, Geo. H. Gooderham, J. E. Kent and C. A. Brown.

Canada at Lyons Fair.—Three booths at the Lyons Industrial Exhibition, to be held in Lyons, France, have been taken by the Canadian Pacific Railway. Exhibits will also be shown by the Ontario and Quebec Governments. Eight firms, three of Montreal, four of Ontario, and one of Nova Scotia, will have exhibits in a booth taken by the Canadian Exporters' Association. The Canadian Consolidated Rubber Co. and the Dominion Bridge Co. have engaged separate booths.

C.M.A. Annual Convention.—The Hamilton branch of the Canadian Manufacturers' Association is trying to get the annual convention of the whole Association here during 1916. It is seven years since the greater body met in Hamilton, and the local members think it would be well worth while for the city authorities to go out of their way to have it return. In conjunction with the meeting of manufacturers, it is proposed to hold a conference regarding national foreign trade, the aim being to direct to Canada business which has heretofore gone to Germany or other countries.

Munitions Order.—It is reported on good authority that orders will shortly be placed in Canada for 6-inch howitzer carriages. These will cost about $10,000 each, and it is likely that the first contracts will be given to the C. P. R. shops at Montreal.

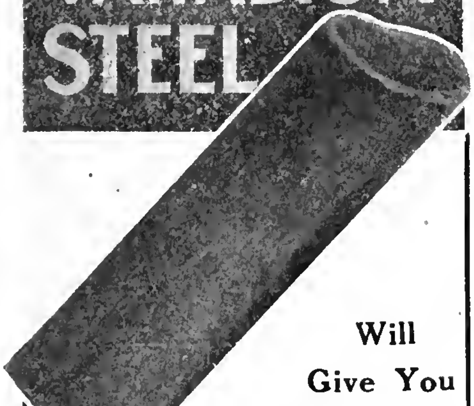
The Fitzhugh-Crowley Corporation, engineers, contractors and railway specialists, has been formed in New York, with offices at 60 Broadway. Mr. E. H. Fitzhugh, the president of the corporation, was formerly vice-president of the Grand Trunk Railway and president and general manager of the Central Vermont Railway. Associated with him is Charles J. Crowley, who is well known in Toronto, and is a railroad engineer of international reputation. Mr. Crowley will act as vice-president and chief engineer of the newly-formed corporation.

No Burlap Licenses.—Burlap trade interests in Montreal have received cable advices from Dundee to the effect that the issuance of further burlap shipping licenses had been postponed indefinitely by the British authorities. Oilcloth and linoleum manufacturers who have contracts with the Scottish mills for substantial quantities of wide goods, were seriously alarmed by the news while the importers of ordinary burlap were also disturbed by reason of bales of Calcutta goods have recently been coming to this country via the United Kingdom.

New Process With Steel.—A new process of coating structural steel or any other exposed metal with zinc is being introduced to those who are interested in such matters, and it is attracting considerable attention because of the ease and thoroughness with which the operation is performed, even after the metal has been put in place. Powdered zinc, compressed air and heat are the three elements which are used in the process, the zinc being driven through a gas burner by the air, where it is instantly reduced to a liquid state, and, as it strikes any surface capable of sustaining the force, it adheres and cools at once.

Ordered to Raise Freights.—For perhaps the first time in the history of the Canadian railroads one has been charging too small a freight rate. The Dominion Railway Commission has decided that the charge of $58\frac{1}{2}$ cents a hundred pounds by the Canadian Northern for taking steel from Sarnia to Regina is too small, and has issued a judgment preventing the company from using this rate. The Imperial Oil Co. has purchased crude steel in Pittsburg for its refinery at Regina. The G. T. R. and the C. P. R. set a rate of $1.04 to take this steel from Sarnia to Regina, and the C. N. R. underbid them. The C. P. R. and the G. T. R., with Winnipeg manufacturers, petitioned the Railway Board to prevent the C. N. R. from charging the low rate.

Peace River Trading & Land Co.—Extending its interests in the north, a syndicate of Old Country capitalists, of which Lord Rhonda (D. A. Thomas), the Welsh coal baron, is head, has acquired the Peace River Trading & Land Co., a concern which has been operating in Northern Alberta and the Peace River districts. The Peace River Tramway & Navigation Co., with which the Thomas interests are also prominently identied, is preparing the right-of-way for the Portage line to be built at Vermilion Falls as a unit of a transportation system that will provide navigation facili-



ties over 200 miles on northern waterways. Oil development work is proceeding briskly around Vermilion. The drillers are now down 450 feet, and are confident of striking oil at an early date.

Ocean Freight Situation.—The volume of business from the Atlantic ports is limited to the amount of ocean tonnage that is obtainable. The present vessel accommodation is insufficient to carry the traffic that is now waiting to be exported. Ocean rates are based on supply and demand, and at the moment the demand so far exceeds the supply that ship owners are almost in a position to make any terms they wish to ask. Some of the United Kingdom ports are not equal to the demand on the other side, consequently the English markets are in many cases bare of supplies, and they are paying relatively high prices to get wheat. The price on this side is not excessively high as compared to what consumers in foreign markets are paying, the extra cost over our prevailing prices is absorbed by the excessive transportation rates that have to be paid.

Personal

A. J. Carroll has been appointed district manager of Eugene F. Phillips Electrical Works, Ltd., with office in Montreal.

W. R. Webb, of Watrous, Sask., has accepted a position with the C. P. R. as manager of their electrical plant at Brandon, Man.

William Casey, who has held the position of assistant general manager, has been promoted to be manager of the Canadian Locomotive Co., Kingston, Ont.

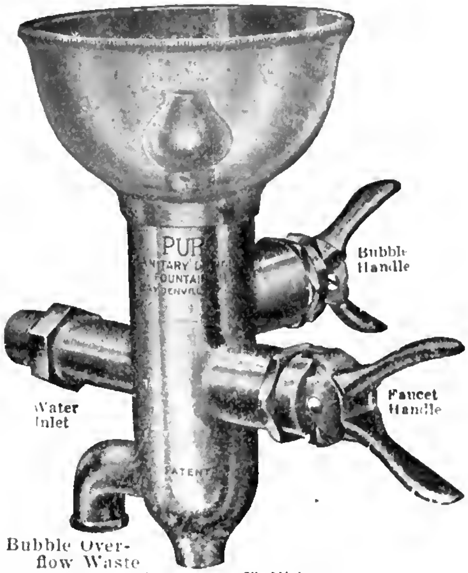
Flight Lieut. Strachan Ince, of Toronto, and at one time with the Canadian Fairbanks-Morse Co., Front Street, Toronto, has been awarded the D.S.O.

P. D. Ross, of Ottawa, has been appointed by the Provincial Hydro-Electric Commission as its representative on the Ottawa Hydro-Electric Commission.

E. Ronan has resigned from the position of manager of the small tool department of H. W. Petrie, Ltd., Toronto, and has enlisted for overseas service.

J. D. McArthur, the well-known Winnipeg railway contractor, will join the board of the Winnipeg Electric Railway Co., in place of the late Sir William Whyte.

W. E. Gorman has been appointed to the position of superintendent for the Excelsior Electric Co., Toronto, on the manufacture of tools and machinery for munitions.



Actual Size 7" High.

Classified Advertising Section

Classified Advertisements

Rates (payable in advance):—2c per word first insertion, 1c per word subsequent insertion. 5c additional each insertion when Box Number is required. Each figure counts as one word.

FOR SALE

18 IN. x 10 FT. BRADFORD LATHE AND countershaft, also 18 in. x 8 ft. Lodge & Shipley, both in splendid condition; immediate delivery. Box 172, Canadian Machinery. (8)

FOR SALE—CINCINNATI ENGINE LATHE, 18" x 6'; taper attachment, hollow spindle, quick-change gears, compound rest, two chucks; also 12 H. P. gas or gasoline engine. Apply Wheeler Needle Works, Paris, Ont. (7)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London, Ont.

MACHINE SHOP WITH MACHINERY, garage and house, on nine thousand four hundred feet land, with adjacent vacant twenty-eight thousand feet; next railway station; good site; good accommodations; twenty miles from Montreal; immediate possession; bonus expectation to big concern. Box 173, Canadian Machinery. (6)

TURRET LATHES FOR SALE—3—2 x 24 Jones & Lamson Turret Lathes, $500.00 to $600.00 each. 3—19" swing Jones & Lamson Turret Lathes, fitted with Diamond Turret. The above machines are in good condition, also 2 Small Turret Machines, 1¼" hole in the Turret Head. Apply to A. B. C., Box 171, Canadian Machinery. (6)

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double bandsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

FOR SALE—50 GOOD MACHINES. BOLT Cutters, Headers, Pointers, Tappers, Automatic Shavers and Slotters, Presses, Drill Press, Slitters, Small Shears, Plain Bench Lathes, Pulleys, etc. Bargain prices. Immediate shipment. Send for descriptive list and prices. Shelton Company, Shelton, Conn., U.S.A. (9)

SITUATIONS VACANT

JUNIOR DRAFTSMAN, EXPERIENCE ON structural work an advantage; permanent position to right man; give fullest possible particulars. Box 174, Canadian Machinery. (7)

WANTED—ENERGETIC FOUNDRY FOREman for Toronto. Experienced on light and heavy grey iron machinery castings. Apply Box 175, Canada Foundryman.

WANTED — MACHINISTS AND FLOOR hands on heavy and miscellaneous medium work; steady employment, modern shop, good wages. Apply, stating age and experience, P.O. Box 6, Walkerville, Ontario. (6)

WANTED—MECHANICAL DRAUGHTSMAN accustomed to marine engines, boilers and piping. State experience, age and salary expected. Apply Box 176, Canadian Machinery.

FOR SALE

2-Phase Induction Motors.
1 only WESTINGHOUSE Type C—50 H.P.
1 only WESTINGHOUSE Type CCL—50 H.P.
1 only CANADIAN GENERAL Type 10—20 H.P.

In excellent condition. Prices attractive. Full particulars on application.

CUMMER - DOWSWELL, LIMITED
HAMILTON, ONT.

WANTED—ASSISTANT FOREMAN FOR machine shop, working on shells; must be a thorough mechanic with previous experience on the larger sized shells and able to take full control of shop employing up to a hundred men. Apply giving full particulars as to experience, with whom previously employed, age, and salary expected, and enclose copies of references. Only those giving full particulars in the first instance will receive consideration. Liberal remuneration to the right man. Apply in confidence to Box 165, Canadian Machinery. (6)

WANTED

WANTED — ONE TURRET LATHE WITH wire feed, and power feed to turret to take round bars up to 1". J. H. Connor & Son, Ltd., Ottawa, Ont.

AGENTS WANTED

BRITISH HOUSE MAKING SYRINGES AND spraying machines for every possible use, need Canadian agents. The line is the most complete in the world and includes knapsack and ordinary spraying machines for fruit growers, limewashing machines for farms, factories, etc. Disinfecting machines for all purposes. Anything in the way of spraying and washing machines made to suit the market. Agents must be aggressive and ready to work the line thoroughly. Write: Spraying Machines, c|o Canadian Machinery, 143 University Avenue, Toronto.

MANUFACTURERS' AGENTS—IMPORTANT Sheffield (England) firm actually manufacturing high speed steel, twist drills, milling cutters, etc., carbon steel, mining drill steel, shear blades, etc., requires a live firm to act as representatives for this part of Canada, at end of war. Write stating experience of above lines, agency conditions, mode of handling the agency, etc., in confidence, to Box 811, Dorland Agency, Ltd., 16 Regent St., London, S.W., England. (8)

FOR SALE

Two 96-horse-power Gas Engines.

Complete with producers.

Made by the largest English manufacturers.

WILL SELL CHEAP

Empire Mfg. Co., Ltd.
London, Ontario.

Sell Your Scrap Materials Direct to the Wholesaler

Get our quotations before selling. We are wholesale dealers in all grades of Scrap Iron, Shrapnel turnings and borings, Scrap Copper, Brass, etc. This week we are paying 27 cents per pound for Scrap Aluminum.

Send for our monthly price list. Our Motto, "Honest dealings and prompt settlements."

L. S. Tarshis & Son
88-92 Wellington St., Montreal

FOR SALE

6—2¼" Cleveland Plain Automatic Screw Machines.

American Machinery Exchange
Incorporated
251 CENTRE ST. NEW YORK CITY

AGENCY WANTED

A firm in England is desirous of securing the sole agency for Great Britain for twist drills, taps, stocks, dies, reamers, milling cutters, etc. Please communicate full particulars to

Box 175
Canadian Machinery

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, MARCH 9, 1916 No. 10

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President H. T. HUNTER, Vice-president

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J Dodd. Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

The Locomotive: From Early Efforts to Modern Developments *

By E. T. Spidy **

Modern methods of locomotion are so increasingly numerous and luxurious that the attempts and failures of the pioneers of travel are too apt to be looked upon as interesting incidents, rather than in their true light as stepping stones to the present wonderful state of land travel. The author describes in a lucid and interesting manner the failures and successes of the men whose names are landmarks in the history and development of locomotion.

THE power of steam was known to Hero of Alexandria about 200 B. C., and a book he wrote then treated of the expansive force of steam. He also described in his book the engine cylinder, piston, slide valve, and the common clack valve. Although this power of steam was "known," its value commercially was never appreciated, and no attempts appear to have been made to turn it to useful and practical effect, even for stationary engines, until 275 years ago.

First Built by a Frenchman

In England, in the year 1759, Dr. Robinson suggested to James Watt the idea of steam carriages to run on common roads. Watt made some models without recorded success. The first practical model was made by a Frenchman named Cugnot in 1763, but this model had a small steam boiler that required the vehicle to stop every fifteen minutes to get up steam. It did, however, attain a speed of three to four miles per hour. Cugnot produced a second and better model in 1769, which recorded the very first step in the history of locomotive development.

The first steam carriage produced in England was made by William Murdock in 1784. It had a copper boiler and steam was generated by a spirit lamp. Following Murdock's success, several inventors, notably Thomas Allen, of London, Thomas of Denton, and Dr. Anderson, a friend of Watt, experimented with steam carriages, but it was not until 1802 that Richard Trevithick patented the application of the non-condensing engine to the propulsion of carriages on railroads. The road was constructed in 1803, and his second engine tried in 1804 was a success.

Trevithick is undoubtedly the "Father of the Locomotive;" he employed high pressure steam. He found by experience that flat wheels had sufficient adhesion upon smooth rails, and he conveyed the exhaust steam from the cylinder to the chimney by means of a pipe which he turned upwards, and discovered by observing the practical result, that the blast of steam caused the fire to burn much better; he therefore called it the blastpipe. This engine ran upon four wheels 4 ft. 6 inches diameter, the boiler was 6 ft. in length, and contained a return flue-tube, the chimney being consequently at the same end as the fire door; the engine had one cylinder, placed horizontally, 8 inches diameter, the stroke being no less than 4 ft. 6 inches.

On the 24th February, 1804, it was tried upon the Penydarran cast iron plate way or tram-road, and conveyed trucks containing ten tons of bar iron and about seventy persons to Merthyr Tydvil, a distance of nine miles. The engine worked satisfactorily from a mechanical point of view, but commercially it was not regarded as a success, being more expensive than the horse traction.

Trevithick does not appear to have followed up the development of the locomotive, but left to others the perfecting of these excellent principles which he introduced and discovered; probably it is on this account that he never has received the credit to which he was justly entitled for the construction of the first locomotive which ever ran upon rails.

The First Commercial Success

Blenkinsop, proprietor of a colliery near Leeds, who was next to take up the development of the locomotive, was under the impression that sufficient adhesion could not be obtained between smooth rails and smooth wheels, and he designed his locomotive with a cog wheel and a rack on the track. This engine ran a daily coal service a distance of 3½ miles from Middleton to Leeds, and started in August 1812. The Blenkinsop had four wheels, 42 in. diameter boiler, had one flue 20 in. diameter, 2 cylinders 8 in. diameter by 20 in. stroke placed vertically. It evaporated 8 cubic feet of water per hour, consumed 75 lbs. of coal per hour. Capable of carrying 94 tons at 3½ miles per hour, maximum speed 10 miles per hour was attained at a load of 20 tons. This engine was a commercial success, and the first on record as such, it being cheaper than horses.

Blackett & Hedley's "Puffing Billy," was the next notable success. Their first attempt was not a success because it was not provided with Trevithick's blast-pipe, but the rebuilt locomotive had its two vertical cylinders connected to beams from which a motion was connected by gears to all wheels. On account of the noise made by the exhaust steam discharging in the blast pipes, it was named "Puffing Billy". Blackett had so much trouble on account of the breaking of the cast plate rails that it was necessary to carry half-a-dozen rails on the engine to replace ones broken on the journey. To prevent breaking of rails both Blackett & Hedley changed their engines from four wheelers to eight wheelers on two four-wheeled bogies or trucks, and to overcome the noise a muffler cylinder was placed on the boiler to interrupt passage of steam to chimney. This was completed in 1915.

Stephenson's First Attempt

During the latter period of Blackett & Hedley's experimenting other engineers were taking up the problem. Among these was George Stephenson who turned out his first locomotive in 1914. The engine, the "Bleucher", conveyed a train of eight waggons of coal weighing 30 tons up a grade of 1 in 450 at a speed of four miles per hour, and then continued in daily service on the Killingworth Railway.

The success of Stephenson's engine marked a second real step of progress of locomotive development. Money was now forthcoming and by 1822 five of Stephenson's engines were working, of similar design to his first engine, hauling coal at the Hetton Colliery near Sunderland.

Up to this time no attempt had been made to run trains other than in private collieries.

In 1816 George Stephenson was appointed engineer of Stockton and Darlington Public Railway, and application made to Parliament for charter. Twice the bill was rejected, but it finally passed in 1821, and on September 27th, 1825, the first public railway in the world was open for passenger traffic. The engine that drew the first train (the only engine the company possessed in fact) was constructed by Messrs. Stephenson & Co., and was named the "Locomotion No. 1," and cost $3000 to build. It had a speed of six to eight miles per hour, two steam cylinders 10 in. dia. by 24 in. stroke, boiler 10 ft. long, 25 lbs. per square inch working pressure, driving wheels 4 ft. diameter outside coupled, total weight of engine in working order 6 ton 10 cwt.

The Locomotion had a tender which ran on four wheels, the frame being of wood. A sheet iron tank mounted on

*From a paper read before the Western Canada Railway Club, Winnipeg, Man.

**Assistant General Foreman, C.P.R. Shops, Winnipeg.

same held 240 gallons of water, having also a coal space for 15 cwt. of coal. Total weight of tender in working order was 2¼ ton.

The Stockton & Darlington Railway now commenced building locomotives as fast as possible. Under Stephenson's direction the Company's sixth engine the "Experiment" was the first on record to have six coupled driving wheels. The cylinders on the engine were also changed from the vertical position and placed at an angle of 45 degrees to the track. By 1833 this railway possessed 26 locomotives.

Americans Purchase Locomotives

Early in 1828 the Delaware & Hudson Canal Company of America, having watched the success of the Stockton & Darlington Railway sent over Mr. Horatio Allen to England with instructions to obtain information, purchase rails and three locomotives. These engines were built during 1828 and delivered in New York early in 1829. Thus, the first locomotive to run on rails in America, the "Stourbridge Lion," was tried on August 9th, 1829 on the Old Mohawk & Hudson Railway.

It is to be noted, that up to this time 1829, the locomotive had not gained much public favor, although much progress in invention had been made, and the directors of the Liverpool & Manchester Railway, to be opened in 1830, were divided in opinion as to the best engine. To decide this question a prize of $3000 was offered to induce a contest for the best locomotive which would draw three times its own weight at ten miles per hour. The total weight of engine not to exceed six tons in working order. and the engine was to effectually consume its own smoke.

The now famous "Rainhill" contest took place, and Stephenson's engine the "Rocket" was the only one to finish the stipulated distance of 70 miles. The Rocket won the prize, attaining a maximum speed of 29 miles per hour.

It must be noted that although George Stephenson was not, and never claimed to be the inventor of the locomotive, still it was he who settled the question at the Rainhill contest, and made the locomotive a practical success which led to the introduction of railways throughout the world.

Chronology of Development

Briefly, the development of the locomotive is shown from 1829 as follows:

1830. Inside cylinders under smoke box first placed on Liverpool & Manchester engine No. 7 the "Planet". This engine also had 139 boiler tubes 1⅝ in. dia., was two-coupled and had a small pair of loading wheels.

1830. Liverpool & Manchester official report showed that 50,000 people had been conveyed on 954 round trips between Liverpool and Manchester.

1830. The "Mercury" by G. Stephenson & Co., was first engine to have frame of engine raised above the axles.

1831. Stephenson built the "John Bull" for the Hudson & Mohawk Railway, which was sent to America in 1831.

1831. De Witt Clinton train operated first regular run in New York State between Albany and Schenectady.

1831. The Baltimore & Ohio Railway offered $4000 for best American made locomotive of 3½ ton weight, to draw 15 ton at 15 miles per hour on the level. Messrs. Davis & Gartner of New York, Pa., built the prize winning engine.

1831. Stephenson employed movable eccentrics in his valve gear, operated by a foot treadle.

1832. Timothy Heckforth's "Wilberforce," with larger cylinders than heretofore introduced, same being 14-¼ in. dia. x 16 in. stroke.

1832. Mr. Baldwin built for the Philadelphia, Germantown & Norristown Railway his first locomotive. (Founder of new famous Baldwin Locomotive Co.) Similar to Rocket.

1833. Steam Trumpet introduced by G. H. Cobay.

1833. Stephenson built an engine for the Saratya & Schenectady Railway of America.

1834. 16 in. cylinders x 20 in. stroke built by Stephenson for Leicester & Swannington Railway.

1834. By 1834 the Liverpool & Manchester had 36 locomotives in operation.

1838. Battle of the gauges commenced and lasted 15 years, up to date 4in.-8½ in. was standard—Great Western introduced broad gauge of 7 ft.

1838-40. Several engines with large driving wheels developed up to 10 ft. (one named Thunderer had 6 ft. dia. wheels geared 3 to 1 making in effect an 18 ft. driver—was a failure.)

1840. Birmingham & Gloucester Railway ordered 8 engines from Norris & Co. of Philadelphia.

1842. Link motion developed by Howe with notch quadrant for Reversing. (Known as Stephenson Motion).

1846. Three cylinder engine developed to balance locomotive by Stephenson & Howe.

1858. French Engineer H. Gifford, patented first injector.

1860. Brick Arch used successfully to use coal instead of coke. Steam jet blower used, also firedoor to admit air to consume smoke.

1870. American Pullman cars introduced in Great Britain.

1875. M. Mallet, a Frenchman, designed and built the first Compound Locomotive, also in 1878 he designed a four cylinder tender compound type locomotive.

1880. Von Barries, introduced the well known intercepting valve for compound locomotives.

Modern Locomotives

From the last named period, up to, and including the present day, there has been an ever-increasing demand for more speed and more tractive power, that is to say, engines capable of haulin heavier trains.

Before proceeding with the present day locomotive, it is necessary to briefly outline the principles upon which the distinctive classess depend.

The limitation of the use of the smooth rail has been the controlling consideration in the development of the locomotive. When the limit of the cylinders had been reached, the wheels of course began to slip on the rails. Then more weight of the engine was placed on the driving wheels in order to increase the grip or adhesion. After this limit had been reached the next step was to couple the driving wheels together, thus making more drivers upon which weight could be loaded with additional resultant tractive power. So much weight was added that a limit was reached, it being found, by an English engineer, to be detrimental to the roadbed and track to carry above a certain weight on the driving wheels. This led to the necessity of leading and trailing trucks to carry the surplus weight, also to the necessity for heavier rails. The coupling of the drivers also led to provision being made for rounding curves. The then rigid wheel base was thus transformed into a flexible wheel base to meet this requirement by redesigning the axle boxes. Having now obtained sufficient power on the wheel grip, the next move was to increase the size of cylinders which required a revision of all the other factors to balance same. It was also found necessary to use larger boilers to supply more steam, to supply more steam larger grate area was necessary and so on the cycle was repeated, in each case the word 'more' figured prominently.

Tractive Power

Locomotives are rated by their tractive power. By tractive power we understand the pull the engine exerts on the drawbar that connects the train. Its value is calculated in pounds although different railroads express it in a percentage form as they see fit. Whatever

the expression, it represents the actual maximum pulling power the locomotive is capable of exerting. The tractive power of a locomotive can be increased by decreasing the size of the driving wheels, which of course affects the speed. Thus it is arranged to handle heavy freight trains at a slow speed; while high speed light passenger trains are run with a locomotive with the same size cylinders but larger driving wheels.

It is now readily realized that all this development led to some definite relations being established between the different types of locomotives, and so it is to-day that in considering the requirements for locomotives, it is only necessary to take into consideration all the known factors, such as tractive power required, ruling grades, speed, etc., and to calculate the diameters of drivers, cylinder sizes combined with the boiler power, the ratio of heating surface, coal consumption, efficiency of superheating etc., and a new locomotive is evolved that will fill the particular requirements of the designer.

If the foregoing in connection with the development of the modern locomotive is borne in mind in the consideration of the following classes of service for which they are intended, it will be realized that the trend of to-day is the same as ever, for more power or more speed.

Switching Locomotives

The requirements for switching service are the ability to start heavy trains, therefore a larger amount of adhesion is required, also it is necessary to run over curves of short radius, thus requiring a short wheel base. American practice has established a distinctive type of locomotive for the service with no leading truck and no trailing truck, thus placing the entire weight of the engine on the drivers. Early types were the four-wheel Switcher or 0-4-0 type as it is called, with a tender attached which has now been practically superseded by the Six-wheel Switcher type by reason of power demands. Heavier switchers still, we now have in the Eight Wheel Switcher, and Ten Wheel Switcher types, each of which has greater capacity than its previous type. Ten Wheel Switchers place a total load on the drivers up to 275,000 lbs. and have a tractive power up to 56,000 lbs.

Tank Switchers are also used extensively for lighter yard service. The first tank switchers had four coupled wheels only, these were augmented by a single pair of trailing wheels and later the extension of the cab and coal bunker made a four wheel trailing truck necessary. Further still we have six coupled tank engines without any trailers. As the boiler power was increased so a pair of trailing wheels was added, followed later by a four wheel truck when the power demanded. It is to be noted that private companies rather than railroads use tank type locomotives.

Freight Locomotives

American practice in freight service is distinctive by reason that a leading single pair of wheels is universally provided for guiding purposes as well as to carry some of the weight of the locomotive. Freight engines must also have a high starting tractive effort that is also capable of being sustained for a long period. As high an average as 98 per cent. of the total weight of the engine is carried on the drivers which are relatively small in diameter. Four coupled freight engines are practically gone, being replaced by the Mogul or 2-6-0 type. To-day however, the Mogul type is used only on the moderate weight class of freight service, it having been replaced for main line traffic by the heavier classes of locomotives. Following the Mogul type, a type of engine that is effective for either passenger or fast freight service of moderate weight was brought into service. This type, known as the Priarie or 2-6-2 type, overcomes the difficulty of the Mogul's limitation of small wheels, by extending the firebox towards the rear and placing an additional pair of wheels in the form of a trailer under same. Driving wheels on Prairie types are the same in diameter as used in passenger service. Having a large boiler and leading wheels it is suitable for high speeds for either freight or passenger trains that come within the limit of the starting capacity of six coupled locomotives.

The Consolidation or 2-8-0 type, together with its rival the Mikado or 2-8-2, are the present mainstay of heavy freight service, and present day discussion of these two types shows how keen the railways of this continent are to obtain the highest efficiency from these engines. Following this development further still, we have the Decapod type with ten drivers and a leading truck, and also the Centipede type which has twelve driving wheels and a leading truck At this point it appears that the limit of coupled wheels in connection with a single pair of cylinders is reached on account of length of wheel base, and the development of the four cylinder articulated locomotives naturally followed.

Articulated Locomotives

The Mallet Articulated locomotive is one that has two independent engines combined into one locomotive. This form of obtaining extra tractive power was suggested by M. Mallet, from whence the term "Mallet Articulated" was derived. The largest locomotive of to-day is of the Triplex Articulated type and has three separate sets of engines. Variations of the original have been introduced on the various roads to obtain suitable power for the individual service requirements. The rear engine and set of drivers is usually rigid with the main frame and boiler, and the forward engine is set on a truck containing six or more driving wheels. This truck rotates from a centre pin on the same principle as the usual engine truck. The boiler front end is in sliding bearings to allow for expansion and other movements. Mallet Articulated engines are mostly all compounds, also the use of superheated steam has become general practice. Steam after having passed through the high pressure cylinders, passes through a ball jointed pipe to the low pressure cylinders, from whence it is exhausted, or otherwise employed.

Advantages claimed for the Mallet Articulated form of compounding engines are as follows:

1. A gain of 50 per cent. is made over the simple locomotive having eight driving wheels and same axle load.

2. Fifty per cent. more load can be hauled with the same amount of fuel equivalent to 33 per cent. saving on ten-mile basis with the same effort of the crew.

3. All weight of locomotive can be used for tractive purposes.

4. Shorter rigid wheel base is easier on the track than with use of simple locomotives having eight driving wheels.

5. The compounding gives a reserve power of 20 per cent. by admitting live steam into all cylinders when conditions demand same.

6. Higher tractive power is obtained compared to the axle load than with ordinary locomotives, by reason that the unbalanced accumulated weight does not occur in both engines at the same time. Thus the most frequent cause for slipping with the ordinary locomotive is overcome.

The articulated locomotives are used chiefly for mountain pusher service in the mountains, also by some of the Southern roads for heavy freight service under extra heavy loads. Also this type is used for yard switching and hump service, where the loads are heavy enough to warrant same.

Passenger Locomotives

Passenger locomotives on this continent are also distinctive in their wheel arrangement, it being universal practice to have a leading four- wheel truck, which is for guiding the locomotive at high speeds as well as to carry weight. This practice is not followed in European countries with any regularity, it being the practice of some roads to place the driving wheels in the lead, it being considered that the large wheels were easier on the track and more readily turned on the curves, on account of less friction of the flanges. However, American practice is practically standardized

in this respect, and the first established type was the "American" or 4-4-0 type. This was rapidly followed by the Atlantic or 4-4-2 type, which accommodated a larger boiler. The natural growth of railways, however, demanded greater capacity, and the ten-wheeler or 4-6-0 type was developed. This type has come to be used similarly to the Prairie or 2-6-2 type locomotive, for either fast freight or passenger service. It is seen that the only difference between the two types is in the distribution of the surplus weight not utilized for tractive purposes.

Pacific or 4-6-2 type passenger locomotive next developed on account of necessary support for larger firebox at the rear, more boiler capacity being required to sustain the high speed demanded by the schedules. Passenger locomotives are required to have an excess of power to meet the extra conditions of weather and weight of train, under which a smaller type of engine would fail. The Pacific type of locomotive carries about 60 per cent. of its weight on the driving wheels. It is thus seen that the majority of railways use either the Prairie, the ten-wheel passenger, or the Pacific 4-6-2 types for practically all its main line long distance traffic. Exceptional conditions demand exceptional engines and hence we have heavier types still for passenger and for mountain service. The 4-8-0 type is a twelve-wheel passenger and freight type that has small drivers, but the 4-8-2 or Mountain type provides a larger boiler which allows the regulation passenger size drivers.

Tank passenger engines are not used extensively in this country, because there is very little of the suburban traffic available where they can operate at an advantage. However, they are used to some extent mostly in the larger ratings for local traffic, also for switching service. Suburban traffic is exclusively handled by tank engines in England, the largest of these on record being a Decapod 0-10-0 type which weighs over 90 tons, and is capable of attaining a speed of 30 miles per hour in 30 seconds with a load attached of 400 tons.

Conclusion

Before leaving the subject, it should be added that most all locomotives with six driving wheels or over now built, are equipped with superheater, it being established that a saving of at least 20 per cent. fuel and 30 per cent. water is effected by its use, whether in switcher, freight or passenger service.

Compounding of the cylinders is more extensively employed in Europe than in this continent, and many systems are employed. The tendency in this country has been in latter years to change the compounds into simple engines which with the addition of a superheater gives a locomotive of greater efficiency than before.

Power fed stoking devices are employed successfully now on many types of locomotives especially the larger types. These consist of a small independent engine in the cab that operates a spiral horizontal elevator which pushes the coal towards the fire-box, at which point it is elevated by various different elevating mechanisms and distributed over the grate.

Special fire-boxes and brick arches are now considered essential to complete combustion when heavy loads are being handled. Other items not to be underestimated in value, are the automatic firedoor, flange oilers, oil burners, pulverized coal burner, power reverse gear, coal passer, all these items are being developed in the present day period.

Where the end in the development of the locomotive will be is hard to imagine; it has never ceased yet. The modern mammoth locomotives of to-day look no bigger to us than did the Rocket in Stephenson's day to the populace of those times, when all locomotives were named "Samsons," or other names suggestive of the largest in the world. We do know that perfection is not reached yet, and so the strife will continue until the end of all things.

SHELL LOADING IN CANADA

ON account of difficulties in getting fuses delivered from the United States and the desirability of having everything possible made in Canada, it was decided, about January 1 this year, to establish a plant in Canada for the loading of time fuses, where all of the latter being manufactured in Canada at different points could be sent to be assembled and loaded.

A suitable site for the plant has been procured, of about 50 acres, situated at ——————, just outside the limits of the city of ——————, where it is expected plenty of labor will be available.

The loading of time fuses is quite an intricate and delicate operation requiring a large amount of skilled labor, and the plant indicated will give employment to about 2,000 people. The buildings are now under construction ,and should be finished and ready for occupation by April 15. All the machinery has been contracted for, and will be delivered about the time that the buildings are ready. The main building covers an area of 500 ft. in length by 250 ft. in width; there are also a number of other buildings of lesser proportions surrounding it.

The component parts of the fuses which will be assembled and loaded at this plant have been contracted for, and are now being made at various other plants in the Dominion, including the Northern Electric Co., Williams Mfg. Co., and Russell Motor Co.

After the fuses are assembled and loaded, they will be sent to —————— where two fuses out of every 100 produced will be subjected to firing tests to prove whether they conform to the specifications as to the time of bursting of the shells to which they are attached.

The fuses are then shipped to the plants at which the shells are being fitted to cartridge cases and attached to the shell nose, after which the complete shell is ready to be shipped to the front.

CHAINS AND OTHER LIFTING APPARATUS

A MEMORANDUM by G. S. Taylor, H. M. Inspector of Factories, entitled Chains and other Lifting Apparatus, has recently been issued by the British Home Office. The author deals with the causes of and possible means of preventing accidents arising from the fracture or failure of chains and such metal appliances as rings, hooks, shackles, eye-bolts, and swivels used for lifting purposes. The whole of the fifty-two pages are full of information, and a valuable feature of the work is a bibliography containing forty references.

Amongst the subjects considered may be mentioned the following:—Legislation; types of appliances; materials; methods of manufacture; kinds and proportions of links, hooks, shackles, eyebolts and swivels; use and wear of chains, slings, and other lifting appliances; testing; annealing; examination; marking; records; failures of chains and other lifting appliances; accidents and dangerous occurrences. In addition there are eight plates of illustrations and five appendices.

HYDRO RADIAL PLANS

THE plans of the Hydro engineers for the proposed Toronto-Niagara section of the Provincial Hydro-Radial system are nearly completed and the various municipalities along the line will before long be given an opportunity to decide whether they want to follow the lead of the municipalities between Toronto and London in preparing for construction by passing the necessary by-laws. Meetings have been held in several places along the probable route to discuss the matter, but definite proposals cannot be submitted until the engineers present their report.

In addition to the Toronto-Niagara and the Toronto-London surveys the commission's engineers have made progress upon surveys covering practically every part of the province.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

SOME OBSERVATIONS ON THE SHIPBUILDING SITUATION

By C. T. R.

THE demand for merchant ships and the lack of the usual opportunity to not only supply them, but to, in some measure, compensate for their wastage through the ravages of war and their wholesale requisitioning for transport and other duties arising from the latter, are at the moment live issues and becoming daily more intensively so.

As far as I can see the outlook for Canadian shipbuilding is very bright, but I believe that most of the business will have to be tonnage required for salt water service. Two lake shipowners have already indicated that while they want tonnage badly they positively will not pay present prices, as they fear they would be discounted in the future to a considerable extent. This may or may not be true, but personally I believe they are wrong. I think that the price of steel and the price of tonnage will keep up for quite a while, and they will be compelled later on to pay a good price for their ships.

Dearth of Skilled Labor

Canadian shipbuilding is now suffering from a serious handicap imposed by the action of the authorities in Great Britain and in Ottawa sending recruiting agents to this country to pick up all available shipbuilding help, in addition, all the machinists and mechanics they could get together to go over to the Old Country to both build and repair warships and make munitions. There is the additional loss occasioned by skilled help joining the colors.

It can readily be understood that men skilled in shipbuilding cannot be replaced by men off the farms, as it takes years of patient training to produce results. The output, therefore, of Canadian shipyards will be limited by the number of men available and by the supply of raw materials. The steel mills in the United States are now overloaded with orders, and are naming from four to six months' delivery; other than that, if material is required for quick delivery, a very heavy premium must be paid, which makes the ships very expensive to the owners.

Second-hand Tonnage

For some time past there has been a wild scramble for second-hand tonnage, owing to the fact that new ships could not be had quick enough to replace the wastage due to the war and other causes, and to the huge amount of German tonnage which is laid up and out of commission all over the globe. Exorbitant prices are being paid, and old ships have been fitted out again, which in ordinary times would possibly not be allowed to clear from any port. This is evident from the fact that on some of these old vessels, as much as twenty-five per cent. insurance for the trip to Archangel has been paid.

Second-hand dealers, therefore, are reaping a golden harvest, while shipbuilders find it difficult to get owners to agree to a price which covers only a reasonable profit, the claim being that while they are prepared to pay fancy prices for immediate tonnage, conditions may change so rapidly that by the time a new ship is built and ready for commission the war may be at an end. This, of course, is mere speculation, but serves as an argument why they should not pay any big prices.

Skilled Men and Material Delivery

If shipbuilders in Canada had all the men they require and could get reasonable deliveries of material, they could get all the tonnage they want to build at the present time. As stated already, however, the scarcity of the proper kind of men and the long delivery on raw materials limits the output. In these years when reasonable returns might be secured to make up for a great many lean periods, other conditions have loomed up which make it very hard indeed for a Canadian shipbuilder to grasp the opportunities now open. The authorities in Ottawa have shown no desire to discriminate in the class of men they enlist first. It is well known that they must get men, but it would be well for the country's industries if they endeavored to take those first who could best be spared.

Mr. Balfour, the First Lord of the British Admiralty, recently stated in the House of Commons that he considered that merchant shipbuilding should be proceeded with as rapidly as possible, and that he considered that merchant tonnage was now second only in importance to munitions themselves and should be treated accordingly. Men in the yards in Great Britain have been exempt from enlisting, men in Lloyd's Register of Shipping, and men in the insurance department of Lloyd's have also been refused permission to join the forces.

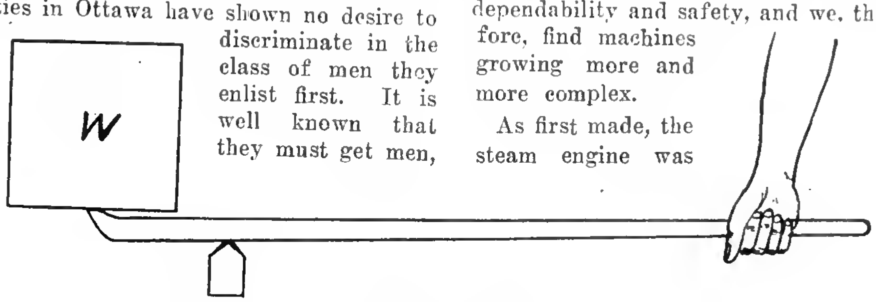
It would appear, therefore, that shipbuilding in Canada, especially where vessels are being built for overseas service, should be given some consideration when men are being enlisted. Lack of discrimination will surely tell in a great many industries besides shipbuilding, but no doubt the authorities at Ottawa who have undertaken to recruit 500,000 men want to make good their promise without taking into consideration what class of men they enlist first.

MECHANICAL SIMPLICITY

By W. B.

THE common crow bar, when used as a lever with a single sharp bearing, as indicated, is the simplest and most efficient machine known. The pulley and shaft, a modification of the crow bar and sharp bearing, becomes a little more complex, and a little more inefficient. With increasing complexity we, therefore, usually find increasing friction, more lost motion, greater up-keep, expense, etc. Complexity is always undesirable.

In our present state of civilization, though, we find complexity a necessity. We are continually striving for greater over-all efficiency, automatic operation, dependability and safety, and we, therefore, find machines growing more and more complex.



SIMPLICITY—CROW BAR AND SHARP BEARING.

As first made, the steam engine was rather cumbersome—complex. The idea was to make a machine that would propel itself and other machinery through the agency of heat. The cost of the energy developed was not considered as worthy of much thought. Inventors bent their principal energies toward simplifying the engine, which they did, and later on, as now, in endeavoring to get the

most work possible out of a pound of coal, the mechanism of the engine has been made more and more complex until we have our present types of steam engines, turbines, gas engines, and other prime movers. Not one can be termed "simple" because they are all made up of many parts.

Every once in a while an inventor produces a change which he says "simplifies the old type," but so far as we can see there is no decided step toward simplicity. Because we are human, we all crave for simplicity in our normal lives. We like simple dress, good speech, manners and so on all the way down to machinery. For a change, one in a while, we like to dabble with complexity, but complexity is not normal. In explaining things we always aim to make the explanation and the thing explained "as simple as possible."

Perhaps when the millennium comes, there will be a one-piece machine with an efficiency of 100 per cent. It will be perfect in every respect, will cost little, will be strong, durable, reliable, simple.

TESTING ARMATURE FAULTS

By W. H. Smith

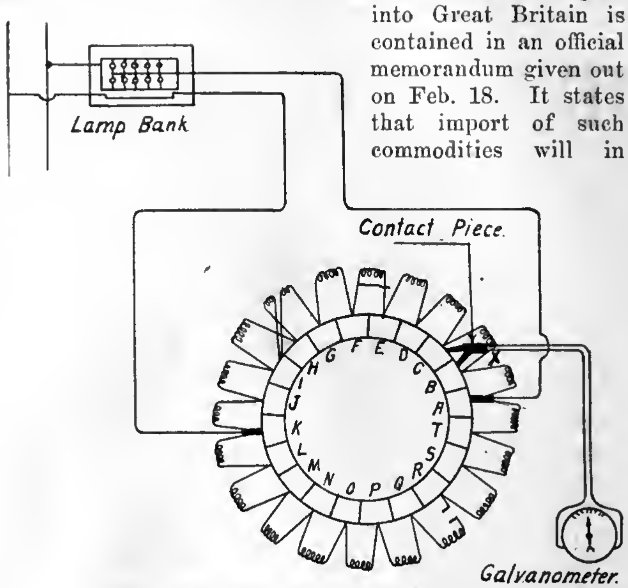
THE bar-to-bar test is, in my opinion, the best that can be carried out by the ordinary operating engineer for detecting armature faults. Briefly, it consists of sending a current through the armature and measuring the drop across adjacent bars. Obviously, if the coils are in good shape, and connected correctly, the drop will be the same between all bars, or at least nearly so.

Referring to the diagram, a current is sent in through the armature at bar A, and out at bar K. The galvanometer is connected to a contact piece in which the contacts are so spaced as to rest on adjacent bars. To make the test, the lamp bank is adjusted so that the galvanometer gives a good readable deflection. Suppose the contact piece is on bars B and C, and a good coil X is between, correctly connected, a standard deflection will be obtained. The latter will also be obtained on each set of bars in moving toward E till bars E and F are bridged, when little or no deflection will be noted as the coil between is short circuited and its resistance lowered thereby.

Bars F and G will give a standard deflection, while bars G and H will give about twice the standard deflection as two coils are connected between. Bars H and I will give a standard deflection but in the opposite direction as the coil is crossed between. Bars I and J will give about twice the standard deflection, due to two coils being between.

In trying the other side of the commutator, we find that bars L and M give no deflection, so the circuit must be open somewhere. No deflection is obtained until we bridge bars Q and R, when a violent throw of the needle locates the open circuit between these bars. Bars P and Q, and S and T show deflection, again proving that the break is in one of the leads to bar R. If these defects are remedied, and all connections are good, about the same deflection will be obtained between all bars, although it will not be the same as the previous standard on account of there now being two paths for the current around the armature where before there was only one.

A temporary remedy for an open circuit is to connect the bars that are open by a short piece of copper wire, but the break should be repaired permanently as soon as possible. A short-circuited coil (except where the turns are short-circuited on each other when temporary repairs are of no avail), may be temporarily repaired by opening the coil at its ends, binding the latter back out of the way, tapping them over, and connecting the bars as for an open circuit. However, a short-circuited coil usually burns itself out, so permanent repairs are in order. The remedy for the crossed or reverse connections is obvious.



TESTING FOR ARMATURE FAULTS.

PRIVY COUNCIL DECISION FAVORS PROVINCES

THE decision of the Privy Council in the companies' case confirming the claims of the provinces in respect to the incorporation of companies will, it is estimated, mean an increase in revenue of $75,000 to $100,000 annually, and removes all fear of the loss of several times that amount now secured by the incorporation of companies.

While the right of the province to incorporate companies doing a portion of their business outside the province has been contested by the Dominion for the past ten years, a large number of charters have been issued in Ontario. Had the decision been against the provinces, this source of revenue would have been largely cut off and the province allowed to incorporate only companies doing business strictly within Ontario. The decision not only removes this fear, but will bring to the Provincial Secretary's Department a good many applications that have previously gone to Ottawa in order to avoid any question of a right to inter-provincial trading.

LICENSES NEEDED TO IMPORT PULP

CONFIRMATION of cable reports of the restriction of paper, paper-making materials and other classes of import into Great Britain is contained in an official memorandum given out on Feb. 18. It states that import of such commodities will in future be governed by license, issued by the British Board of Trade. Presumably, the export of Canadian pulp and paper, through the operation of the license system, will be permitted.

The memorandum states: "Information has been received from London that on and after March 1, 1916, the importation into the United Kingdom of the following goods is hereby prohibited; all materials for the manufacture of paper, including wood pulp, esparto grass and linen, and cotton rags, paper and cardboard, including strawboard, pasteboard, millboard and wood pulp board and manufactures of paper and cardboard; all periodical publications exceeding 16, pages in length, imported otherwise than in single copies through the post; tobacco, unmanufactured and manufactured, including cigars and cigarettes; furniture woods, hardwoods and veneers, stones and slates.

Navy Makes Munitions.—David Lloyd George, British Minister of Munitions, has written Vice-Admiral Beatty, as follows:—"I have been greatly interested in the details of the splendid work done by the officers and men of the battle-cruiser fleet in making munitions. The output which has already been reached is very striking, but more important even than the material results is the magnificent spirit which prompted the men of the fleet to devote their leisure to giving the men in the trenches such loyal and effective support.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

MACHINING SPIRAL GROOVES IN RECLAIMING ROLLS

By H. C. F.

THE art of reclaiming old rubber has been practised for some considerable time, but recently, owing to the extensive use of rubber commodities for variety services, and the resulting high price of the material in its crude state, methods of reclaiming the old stock, such as that from vehicle tires, etc., have showed noticeable advancement.

In reclaiming rubber, there are two principal methods in use—the mechanical and the chemical—the former being the most commonly employed. By it the old rubber is run through rolls, being thereby ground to a powder, the latter afterwards passing over magnetized plates, to remove any particles of iron that may be mixed with it. The powder is further subjected to a current of air, which removes the felt or canvas, these having in the meantime taken the form of fluff and easy of elimination.

The rolls on the reclaiming machine—commonly called shoddy rolls—consist of a suitable iron core heavily sheathed with brass. They are made in a variety of sizes, the average being about 12 inches in diameter by 4 feet long, and having a series of spiral V-shaped grooves cut longitudinally along the outside diameter.

The machining of these grooves requires a certain amount of ingenuity, especially when it is considered that the rolls are often too large to be accommodated on a milling machine table. In such cases the grooves are machined on a planer by means of a special fixture, which is similar in many respects to the ordinary taper attachment found on the majority of modern lathes.

Views of the planer arrangement, together with the necessary attachments, are shown by the accompanying sketches, Figs. 1 and 2. The roll is rigidly supported between the centres, a worm gear A of suitable proportions having been previously fitted to one end of the mandrel. The gear is driven by means of the worm B and the connecting rod C. The connecting rod is supported in two suitable boxes as shown, being made a sliding fit for same, while one end is flattened and connected directly to a suitable cross-head D. The former block or plate E, which is firmly supported on three brackets bolted to the side of the planer bed, has a tapered slot of the desired proportions to accommodate the cross-head, and machined along its entire length.

The process of forming the spiral slots may be followed by referring to Fig. 1, in which the attachment is in the position it assumes at the beginning of the cut. The tool, having been locked centrally in position, is then ready to take the first cut, and, as the work moves in the direction of the tool, the roll is gradually rotated, enabling the tool to cut the desired spiral. This is accomplished by means of the cross-head following the tapered ways in the former block, and causing the attached connecting rod to operate the worm. It must be noted that the worm does not revolve, but simply acts or slides in a horizontal direction—similar to a rack, causing the worm gear to revolve through the required distance. On the return stroke the gear is revolved in the opposite direction, the travel of the spiral being the same as in the cutting stroke. The tool is next fed down by hand, and another cut taken, this being the procedure until the desired depth of groove is reached.

Upon the completion of the first groove, the cross-head pin is removed and the worm revolved by hand through one complete revolution. The roll is by this means turned until it is in position for the second cut. The cross-head pin is again replaced and the next groove machined. It will be noted that no indexing plate is necessary with this attachment, the spacing of the grooves being previously determined, and the teeth of the worm gear being cut in accordance with the number of grooves on the roll.

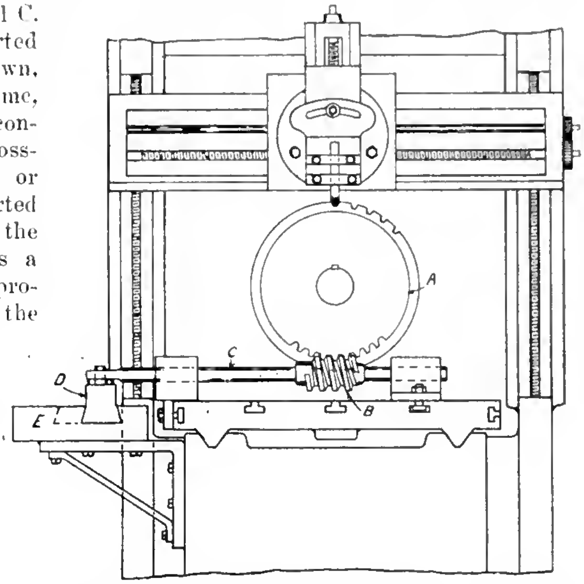


FIG. 2. MACHINING SPIRAL GROOVES IN RUBBER RECLAIMING ROLLS

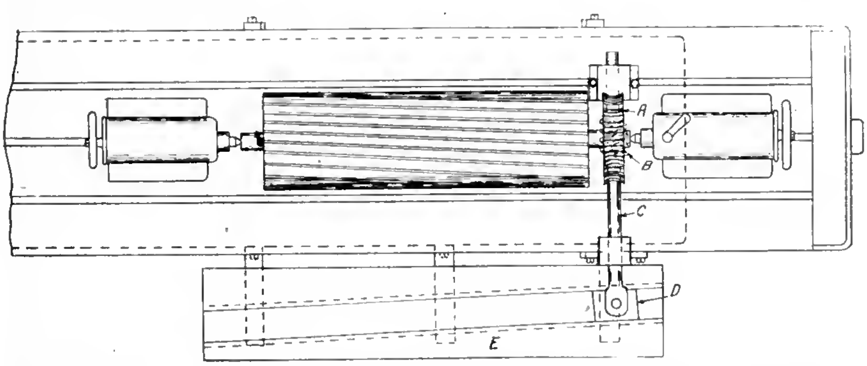


FIG. 1. MACHINING SPIRAL GROOVES IN RUBBER RECLAIMING ROLLS.

METHOD OF LAYING OUT AND BORING JIG PLATES

By A. E. Granville

ALMOST every shop doing a general line of work is called upon, at least occasionally, to make some special jig or fixture requiring a fair degree of accuracy. Drilling jigs, where the accurate laying out of the holes is not imperative may be laid out with a scale and prick punch, but only approximate distances can be obtained in this way.

The button method of laying out a jig plate, while accurate, is more difficult than the one described in this article. A centre indicator must be used to correctly set for a hole after the button or buttons have been correctly placed. The buttons used are a bother to make and are of no earthly use for anything else, while the adjustable parallels employed as described here, may also be used for numerous other toolroom jobs, provided good care is taken not to bung them up

so as to make them untrue. If the parallels are made with care in the first place, and well kept, perfect satisfaction will result for years. Parallels of this type may be obtained from tool makers at a very reasonable cost if it is not desired to make them in the shop where they are to be used.

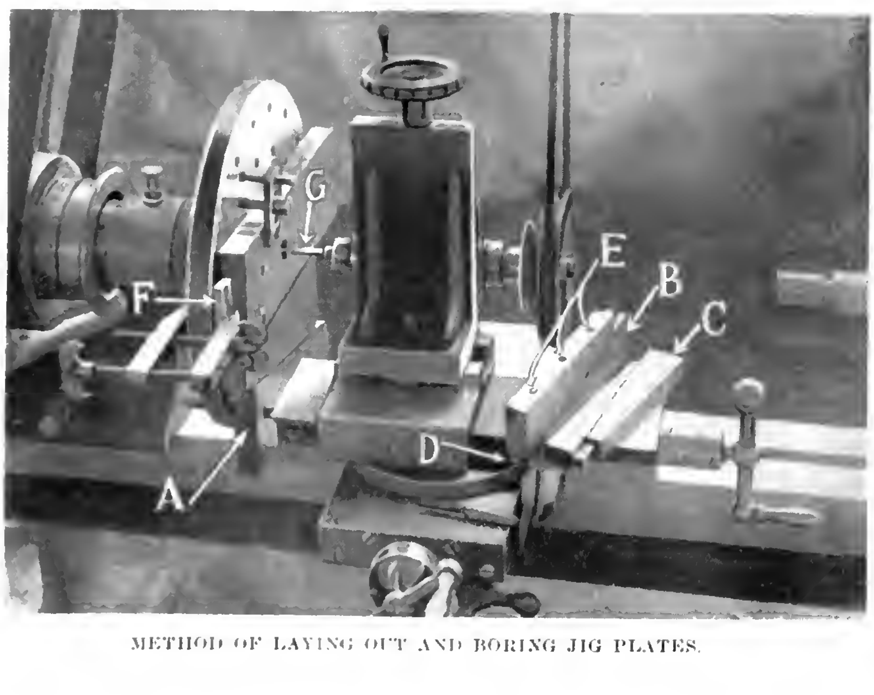
Sets of adjustable parallels are shown in the accompanying halftone at A, B and C. These give a good idea of the construction. A set should consist of enough of the parallels to cover all ordinary distance ranges, and they should be made in sizes that overlap enough so as to not require being pulled out too far in order to reach the next larger size. As shown, the two parts of a parallel are held together by means of a tongue and T-strip working in a T-slot. The T-strip is so placed that it may be tightened by means of screws like E. The angle of the sliding surfaces may be from 10 to 20 degs., although 15 degs. is a very satisfactory angle and has little tendency to slip even when set without tightening the locking screws.

How Parallels are Used

In using these adjustable parallels to lay out and bore a jig plate, the plate itself should be machined on both sides and at least one edge lengthwise. If it is square, any edge will do. One end should also be finished approximately at right angles to the other machined edge. As a rule, it is better to finish the plate all over, but the foregoing will do in many cases, and saves the time that many toolmakers like to spend "truing up," where it is not absolutely necessary.

The method of procedure will vary somewhat according to individual ideas, but a good way is to place the plate about as shown in the half-tone, with the hole nearest to the upper right hand corner prick-punched approximately true. This first hole may be measured off from the edges with a scale if desired. After the plate has been set for the approximate height by adjusting the parallel set on the lathe bed, the strip F is butted snugly against the finished end and clamped solid when the centre punch mark is opposite the centre of the drill G. The plate is now clamped securely and the hole drilled, bored out and reamed to size.

The plate is afterwards removed and the parallel under it slid up high enough to bring the next hole exactly in line with the centre of the drill, the width of the parallel being measured with a micrometer and locked in exact position. If the hole is to be directly under the first one, the plate should be carefully butted against the end strip and clamped. The hole is then finished like the first one. If the second hole is to be nearer the left end than the first, then a parallel of the proper thickness should be inserted between the end and the strip, micrometer measurements on the parallel being of course used. If the distance of the second hole is only slightly to the left, it is better to start with an adjustable parallel between the end of the plate and the vertical strip in the first place, as it is easier to adjust the parallel than to insert one small enough.

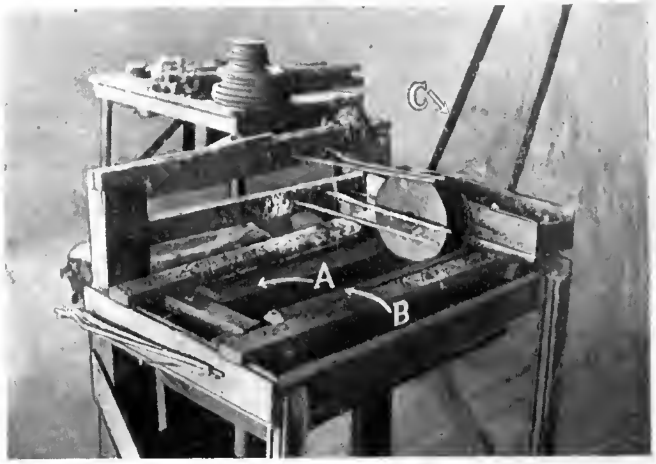


METHOD OF LAYING OUT AND BORING JIG PLATES.

A little thought will quickly show any good mechanic the idea. The beauty of the method is that the parallels can be set by using outside micrometers and the width adjusted exactly. The same method may be used on a drill press by locking the table and clamping two strips on the table at right-angles to each other for the adjustable parallels to rest against. In fact for all-around accuracy and application, I know of no other method that approaches it. Where a micrometer of the desired size is not available for setting the parallels, a Vernier caliper may be used with very good results.

SOAKING WORN POLISHING WHEELS

By G. Lock



SOAKING WORN POLISHING WHEELS.

IT is often a nuisance to properly soak the old abrasive off worn polishing wheels, preparatory to recoating, without soaking the whole wheel, which in many cases is undesirable. The device shown obviates this, and the soaking is done automatically after the wheel is placed in the machine. Two rollers A and B are provided for the wheel to rest on as shown. The roller A is driven by means of a pulley from the belt C. It revolves slowly and the water is high enough in the tank to just submerge the lower rim of the wheel as it revolves. A number of wheels can be placed in the tank at once, as holes are bored in the brackets at the back into which rods are thrust for guides.

One of the chief uses of magnesium is as a scavenging alloy: i.e., clearing up oxides of other metals and making far denser, cleaner, stronger, and more homogeneous alloys. It is valuable in aluminum, nickel, copper, brass, bronze, etc., and special steels, because of its intense avidity for both oxygen and nitrogen.

CONTEMPORARY WAR ARTICLES

Embracing Information and Data Drawn from a Variety of Sources Relative to and Arising from the Prosecution of this Many-Sided European War

ONE OF BRITAIN'S NEW PROJECTILE-MAKING PLANTS—II.

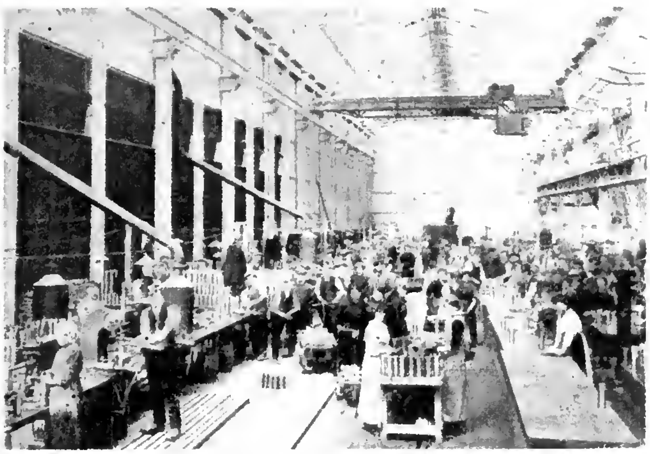
In order to convey an idea, especially to the layman, of the advantage of concentrating shell manufacture in such establishments, some details may be given regarding the extent of the work on each shell, and the direction in which labor and time can be saved. In the case of the small shells, the press operations number seven, and the machining operations — done entirely by female labor—seventeen, up to and including the fixing on of the copper band to conform to the rifling of the gun. In the process of filling there are twenty-one operations in the case of shrapnel shell. This does not include the making and fitting of the fuse and the filling-in of the explosive contents; these operations number forty-five.

Thus, from beginning to end there are nearly one hundred operations, and each shell may pass through the hands of one hundred workers. Although there is an immense multiplicity of tools suitable for each operation, the shell, from the time it enters the shop as a bar until it leaves ready to be put into the breech of a gun, travels only 400 yards. Here, in itself, is a justification for the aggregation in one building of the plant to complete the whole process of manufacture. The same holds to an even greater extent with the heavier shells.

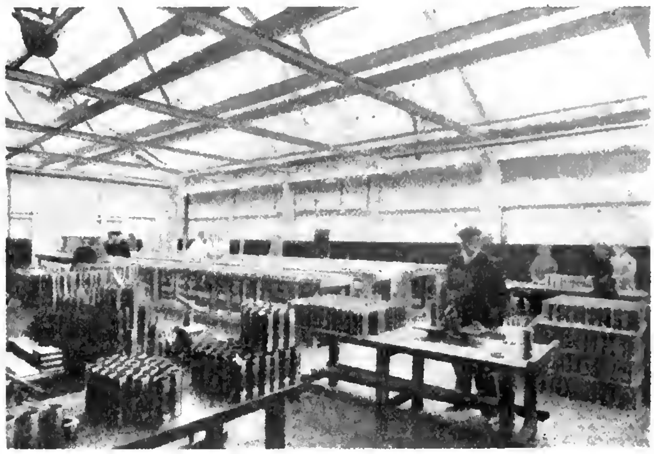
Similar notes may be given, largely for the benefit of the inexpert, with regard, say, to the medium-sized high-explosive shell. In this case, a large part of the work is done by partially-skilled labor. In the press-shop there are eight operations; the shell-body is then transferred to another bay, where it is machined, the operations numbering twenty-two, from the rough turning to the fitting of the copper band; after which the shells are screwed at the nose and a brass bush fitted. The shells are finally gauged all over and taken to the scales to be weighed; the margin for more or less weight than the standard being exceedingly small.

Before the brass bush is finally fitted, the shells are transferred to the washing department, where they are dipped into tanks containing hot caustic soda, to remove grease and dirt from the inside surface. They are next immersed in hot clean water, and subsequently allowed to dry. After this, they are coated internally with copal varnish and then transferred to gas-stoves having a temperature of about 300 degs. Fah., in order that the varnish may be dried effectively.

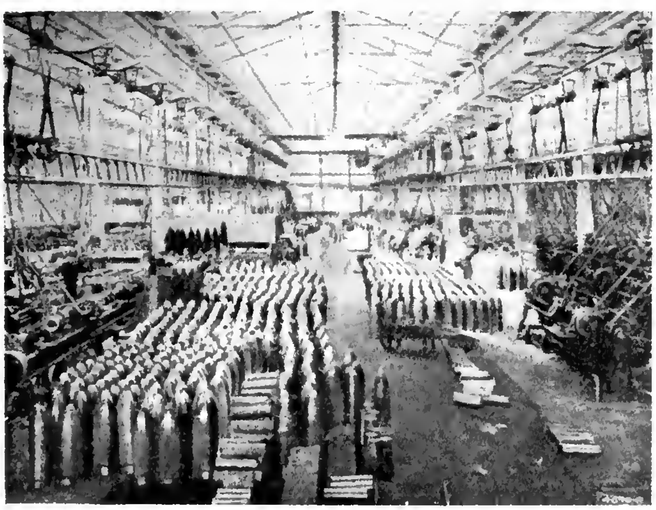
Finally, the copper band is fitted in position in a press and the brass bush screwed in position. The shell at this stage is ready to be filled with explosive



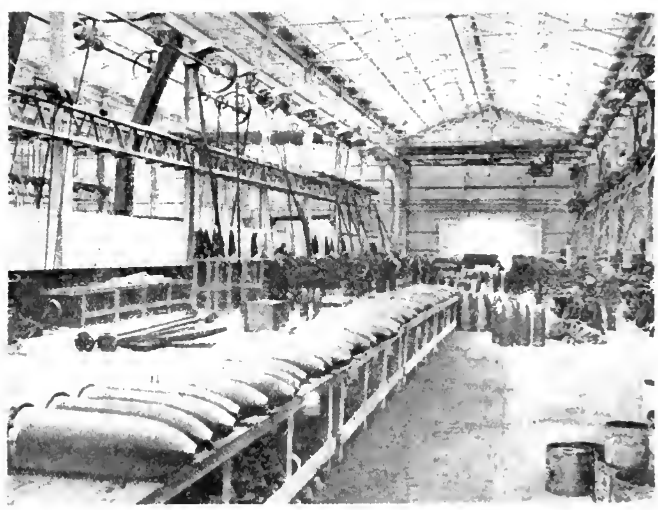
ASSEMBLING SMALL SHELLS.



INSPECTING SMALL SHELLS.



LARGE SHELL INSPECTION DEPARTMENT.



SHOWING LARGE SHELLS COMPLETED.

and fitted with a fuse. Similar processes are carried out in connection with even the largest of the high explosive shells.

Crane Equipment

An essential to rapid work is the provision of a sufficient number of cranes. The enormous amount of work to be dealt with may be appreciated from the fact that there are no fewer than twenty-nine electric overhead travelling cranes, twenty-eight of these having a lifting capacity of 2 tons, and one of 5 tons, for handling the heavy parts of the presses. All the cranes are of the three-motor type, and have lifting speeds of 25 ft. per minute, cross-traverse of 100 ft. per minute, and longitudinal travel of 275 ft. per minute. Each crane is controlled from a cage suspended under the crane-girders, from which the operator has an uninterrupted view of the shop floor which he is serving. In addition to these cranes, jib-cranes are installed for handling the large billets from the furnaces to the presses.

Female Labor Feature

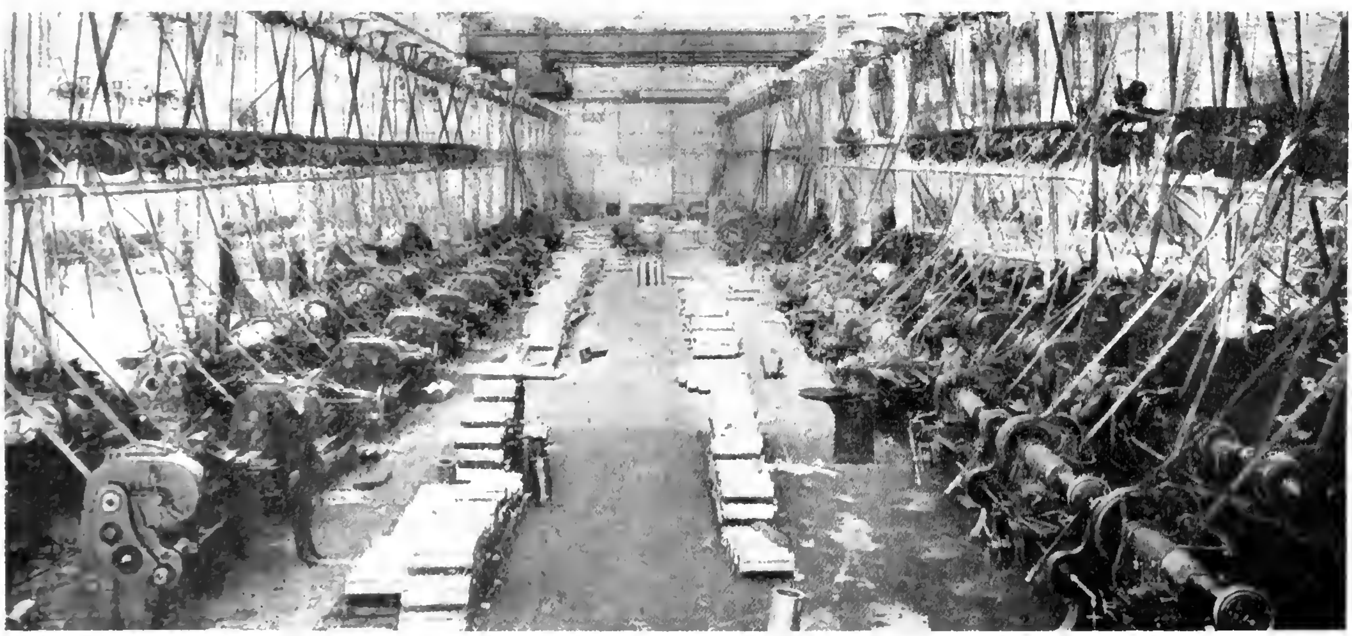
The small shells are machined entirely by female workers. In the shop described there are 1,800 of them, all imbued with the spirit of serving in emergency in the interests of the nation. Indeed, if in any day the output is a little down, a gentle appeal from the manager is enough to reawaken the workers to the needs of the Army. A girl commencing in the department is able to work a machine after three days' teaching, and becomes quite an efficient machine-worker after seven days, while at the end of two months' experience she attains the highest efficiency. As a rule, one skilled worker can supervise and set the machines for twelve of the female operatives. The work is well done. The accuracy to which the work has to be completed is 4-1000 part of an inch, and it says much for the care taken that not more than 1 per cent. of the shells made are rejected.

We do not propose to describe the various tools used, as they are all more or less of standard type. Nor is it desirable, in the national interest, to say more of the processes, but to promote the education of the general public, it may be said that in the manufacture of the 3 in. shell the cutting tools of the successive machines travel over 1,000 feet, and the average speed is 55 ft. per minute. It is not, therefore, in the actual machine that time is required, but in the movement of the shell from point to point, so that it is in at the highest degree important to have the machines for the successive operations as close to each other as space will admit, and not to have them in different factories.

It need scarcely be said that the women workers are specially circumstanced so far as dining-rooms and cloak-room facilities are concerned. The 24 hours are divided into three equal portions, so that the female workers are only eight hours at work, but the machines are kept going for the full 24 hours. Under the matrons they work enthusiastically, and earn large wages on the premium-bonus

LARGE SHELLS INSPECTION DEPARTMENT.

LARGE SHELLS READY FOR DESPATCH.



LARGE SHELL MACHINE SHOP OF BRITISH MUNITIONS PLANT.

system, while absent time is rarely over 2 per cent. of the total for each week.

A Meritorious Achievement

This general description of one of th many new shell factories brought into complete operation within six months, or at most eight months, of the clearing of the ground, goes some way to prove that however unprepared we were for a great European war, the authorities have not been idle in making a thoroughly adequate arrangement for ensuring that the fullest possible demands of the Army shall be met, and the requirements will be continuously supplied in full measure. At the same time great help is being given to our Allies in supplies of ammunition. The one need is for the supply not only of unskilled and partially-skilled men and of women, but also of skilled workers to supervise the operations of the others.

There has been difficulty in securing an adequacy of experts for the running of these factories; but this is now being met, and as the trade unionists are taking a wider view and more satisfactory attitude with regard to the national needs, the people of the country may rest assured that in the immediate future the supply of shells, if not of all ammunition, for the prosecution of the war to a successful end will be continuously abundant and also that it will be secured at a highly reasonable expenditure.—Engineering.

TAXATION OF WAR PROFITS IN FOREIGN COUNTRIES

IT is quite comprehensible that in deciding to impose a tax on war profits each country should adopt that particular method which is best adapted to meet its own interests, says the Engineer. In the case of France the Government has recently introduced a scheme for the levying of a progressive tax on the profits of every firm or company concerned. The preamble cites a typical case of an establishment which earns excess profits amounting to £24,000 in a year. It is proposed to levy 5 per cent. on the first £400; the second stage is 10 per cent. on £1,600; the third stage is 15 per cent. on £2,000; the fourth 20 per cent. on £4,000; the fifth 25 per cent. on £12,000, and the sixth and final stage is a tax of 30 per cent. on £40,000.

As the typical establishment has not earned any excess profits to which the final stage applies, but only £24,000, the total amount which it is required to pay on this sum is £5,080, or an average of slightly over 21 per cent. Of course, when the profits are much greater than the sum in question the percentage thereof payable will increase, but as the maximum proposed is 30 per cent., it cannot exceed this rate. As in Great Britain, provision is also made in France before arriving at the net profits for extra wear and tear of machinery, buildings, etc., due to the poduction of war materials.

Italy's Taxation

Turning now to the kingdom of Italy, we find that the tax on war profits, which was sanctioned last November, has been arranged in the form of an addition to the existing income tax, and is divided into two sections, one dealing with manufacturers and the other with merchants or other intermediaries who are realizing excess profits though the war. As the amount of the super-tax is precisely identical in each division, and the merchant section is rather difficult to explain, it will be sufficient to refer merely to the other.

The law exempts excess war profits up to 8 per cent. of the capital employed on the production of war material, but where the excess profits range from 8 per cent. to 10 per cent. of the capital the super-tax amounts to 4s. per £4; from 10 to 15 per cent. 12s. per £4; from 15 to 20 per cent. 16s. per £4; and over 20 per cent., which is the maximum, the amount payable for every £4 of excess profits is £1 4s. In other words, the highest precentage leviable, also after having allowed for exceptional depreciation of plant and machinery, is 30 per cent., which rate is now being followed in France, as previously mentioned.

Russian Taxation

We are not quite certain whether the Russian tax has yet been imposed, but the Bill prepared by the Minister of Finance at the end of last December creates two classes of contributors towards the Treasury. The first consists of those particular companies and individuals who are not under any obligation to publish their accounts. In these cases, and where the annual net profits reach at least £150, and they are at least £50 more than in 1914, the tax amounts to 20 per cent. of the sum in excess of the £50.

The companies which have to submit to public accounts are to be subject to a graduated tax on account of profits which are greater than in 1914. If these excess profits are superior to 3 per cent. of the capital employed the tax is 20 per cent. on the profits amounting to between 3 and 4 per cent. of the capital, 31 per cent. for profits representing 10 per cent. of the capital, and 50 per cent. for profits of over 30 per cent. of the capital employed.

Summary

It will be seen that the French proposal is for a maximum tax of 30 per cent., and the Italian law already in operation is also for an identical percentage applicable to war profits, while the Russian maximum is also considerably lower than the rate to which British controlled establishments have been subjected by law. Even the German system is more advantageous to the native producers of war materials. The regulations issued at the beginning of this year to give effect to the law passed by the Reichstag provide for the allocation to a special reserve fund of 50 per cent. of the profits realized in excess of the average of the three years preceding the war, and the amounts represented by these funds are to be invested in German Imperial or Federal State loans. Apparently, then, the tax is not a war profits tax, as the contributors are to receive Government paper in exchange for their money, paper or otherwise; but the prospective value of the paper at the conclusion of the war is quite another matter.

MAGNESIUM IN FOUNDRY WORK

THE use of slightly less than 2 per cent. of magnesium in aluminum castings cleans up the aluminum and leaves 0.75 to 1½ per cent. in the casting, almost doubling its strength and quadrupling its resistance to shock or jar. It reduces the cost of machining more than 50 per cent., halving the number of resets on the cutting tool, giving clean cut machine surfaces, and permitting a polish to be secured with the last cut instead of a separate operation. With care, 1½ per cent. of magnesium at $5.50 per pound is all that is needed: i.e., 8¼ per pound of casting actually required to do the same work. The increase in strength means, in some cases, a reduction in weight of casting of 50 per cent.

The reduction in casting weight is generally not less than 25 per cent. The weight of a pure aluminum casting may therefore be reduced, if this 1½ per cent. of magnesium is used, by from 25 to 50 per cent. This is a great saving even at normal prices of aluminum, since it amounts to about one-fourth of 20c, or 5c. With aluminum at 60c per pound, it amounts to 15c worth of aluminum saved, with a stronger and more stable mechanical result. The saving in machine work alone, when the casting is to receive much machining, more than pays for the use of magnesium.—Dr. W. H. Grosvenor.

The Department of Trade and Commerce, Ottawa, has received the following inquiries:—No. 123—A commission agent in Calais, France, desires to get in touch with manufacturers of galvanized barb wire and copper wire. No. 129—A concern in Paris, France, would like to hear from manufacturers of electrical and mechanical equipment, such as are used by railways, etc.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

HEAVY DUTY MANUFACTURING LATHE

A HEAVY duty manufacturing lathe, swinging 20 inches over ways and 11 inches over-bridge, has been placed on the market by H. W. Petrie, Montreal, Ltd. The object aimed at in designing this machine was to provide a lathe which would be capable of producing work at a speed equal to that of larger machines having a greater swing, but without their increased cost and reduced rigidity. By reducing the swing to a size slightly larger than the work, a design is secured which not only possesses all possible stiffness and more convenience of operation, but whose output is limited solely by what the cutting tools will stand when operating on forgings, projectiles and similar work with a finished diameter of 8 in. or less.

Renewable bronze bearings, with ample lubrication, are fitted to all headstock journals. The end thrust bearing is made with hardened steel washers alternating with bronze, and is provided with an adjustment for taking up wear.

The bed is of liberal proportions, the walls being extra thick and tied together by heavy box girths at close intervals. An improved type of wide angle vee on the front shear takes the thrust of the cutting tool, the rear shear being entirely flat. Planed pads on the back of the bed are provided for attaching taper and forming attachments.

The carriage has a width of 12 in. across the bridge, which is made very deep to avoid springing. Lifting of the carriage is prevented by gibbing under the rear of the bed. A double plate type of apron affords a support for both ends of all feed gear shafts. The friction feed is engaged by a hand wheel and seats the friction with slight effort on the part of the operator.

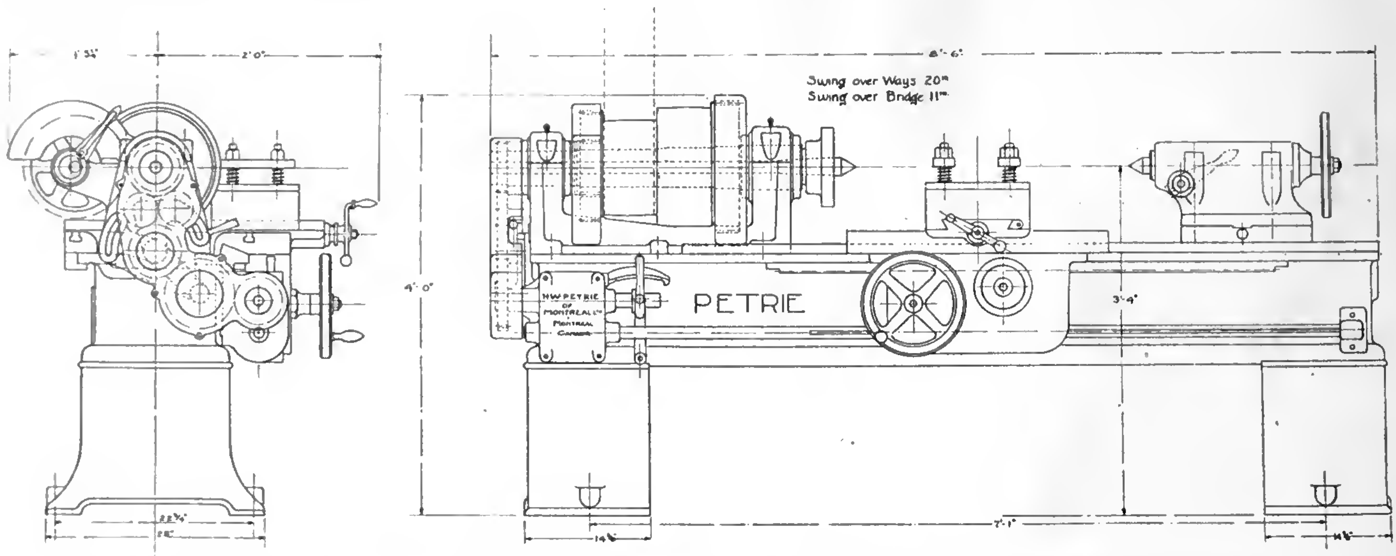
All feeds are positively gear-driven from headstock spindle, three rates of feed—$\frac{1}{8}$in., 1-16 in. and 1-32 in., being obtained through feed gear of the sliding key type.

The tailstock casting is clamped to the bed by four large locking bolts extending to the top of the barrel. A simple binding clamp is located at the extreme front end of the tailstock, where it grips the spindle with the greatest security and an entire absence of distortion. The spindle screw is of suitable proportions, while a set-over adjustment is provided for taper work.

The standard bed is 8 ft. long, and regular equipment includes one driving plate, heavy duty plain rest, with hand cross-feed, the necessary wrenches and two-speed countershaft.

Extras furnished are forming attachment ,turret tool post, hand or power-feed bed turret, oil pan, pump and connections.

Principal particulars are as follows:-- Distance between centres on 8-ft. bed, 40 in.; front spindle bearing, 4 15-16 in. x $6\frac{3}{4}$ in.; rear, 4 in. x $5\frac{1}{2}$ in.; hole through spindle, 1 5-16 in.; Morse taper centres, No. 5; driving belt, 6 in. wide; back gear ratio, 6.7 to 1; countershaft pulleys, 16 in. x $6\frac{1}{4}$ in. x 110 revs. per min.; approximate weight, 4,800 lbs.



HEAVY DUTY MANUFACTURING LATHE, SWINGING 20 INCHES OVER WAYS AND 11 INCHES OVER BRIDGE

AUTOMATIC STEAM TOWING WINCH

THE annual outlay for renewing Manila tow-line is an item of considerable importance in the towing business, and any means whereby such expense can be reduced safely and profitably will be welcomed by all engaged in this business.

The Corbet double steam cylinder automatic vessel towing winch has been designed to use steel cable, which has a useful life of many years, this feature, along with the saving of manual labor, resulting in considerable reduction of operating costs.

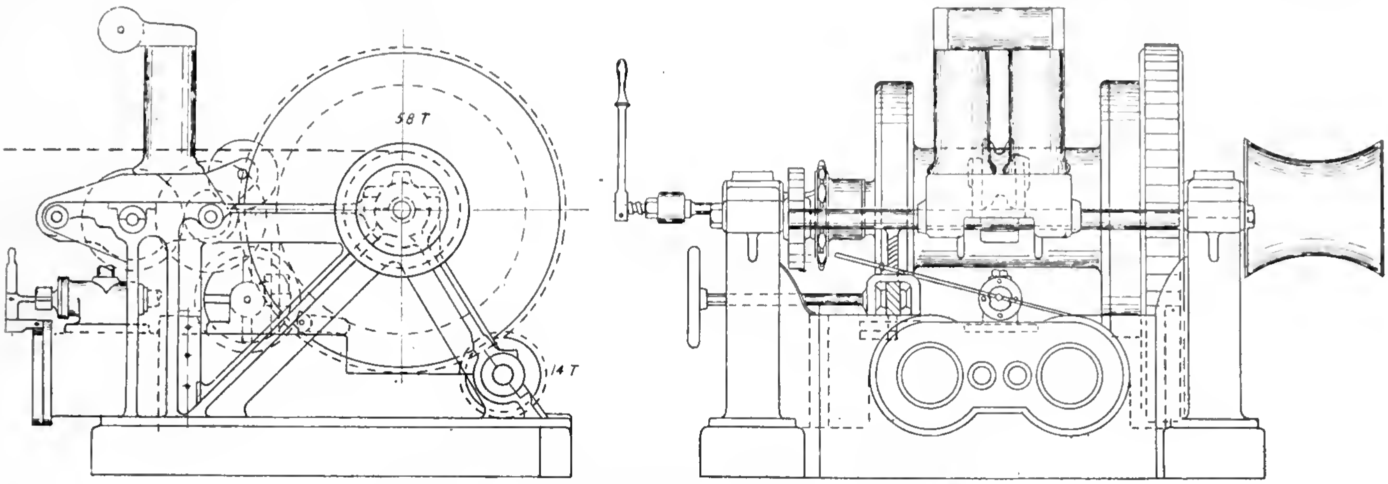
The machine, two views of which are shown in the accompanying illustration, has accommodation for 1,200 feet of 1-in. steel hawser, which passes through the automatic hawser leader which travels to and fro across the front of the machine, thereby preventing the hawser from climbing on top of itself on the drum. This leader is traversed by means of a shaft having right and left-hand screws, and it is geared to the drum, so that the sideways movement of the leader is in proportion to the speed of the drum. It further enables the hawser to be drawn in when the tug-boat is at any angle with the object in tow.

The entire operation is controlled by one lever, which starts, stops, and reverses, one man operating it with ease. The engine is located between the side frames and consists of two 8 in. x 8 in. cylinders ,operating the drum and spool by a 10 in. diameter pinion on the crank shaft meshing with a 52 in. diameter

gear on the drum shaft, both of 4 in. face. The spool can be operated independently of the drum by means of a friction between the gear and the drum, thereby enabling the winch to serve two purposes at one and the same time.

The location of the cylinders to the rear of the drum allows the winch to be placed nearer the centre of the tug, so as to facilitate steering, while the whole design is kept as low as possible to reduce the tendency to tip when the tug is at right angles to the direction of the tow. In the case of the largest size machines, this effect is obtained by putting the cylinders outside of the frame, thus allowing the reduced height to be maintained.

The Corbet Foundry & Machine Co., Ltd., of Owen Sound, Ont., are the builders of these winches.



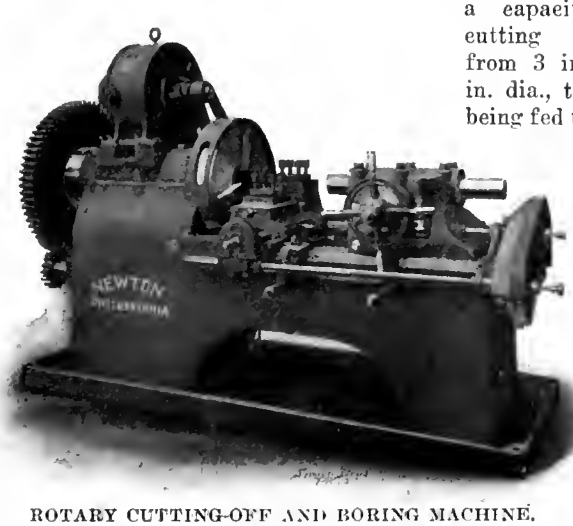
STEAM TOWING WINCH WITH AUTOMATIC HAWSER LEAD.

COMBINED CUTTING-OFF AND BORING MACHINE

A COMBINED cutting-off and boring machine, having a capacity for boring shells 8 in. diameter, is shown in the accompanying illustration, being the product of the Newton Machine Tool Works, Inc., Philadelphia.

Individual electric motor drive is provided, the drive from motor being through silent chain to the gearing which drives the hollow spindle by means of the large spur gear on the end. The spindle admits bars 8 in. diameter, and is provided with a heavy three-jaw chuck.

The bed of the machine is of rugged design, and is surrounded by a floor pan. A substantial boring bar carriage, with power feed, is mounted on the bed, which also carries the cutting-off attachment, the feed gears being so arranged that cutting-off and boring are both done at the one operation.



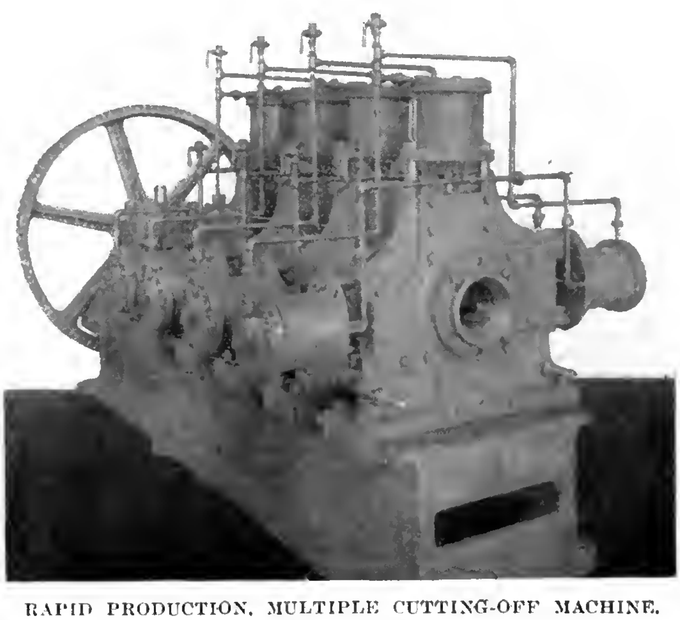
ROTARY CUTTING-OFF AND BORING MACHINE.

RAPID PRODUCTION MULTIPLE CUTTING-OFF MACHINE

THIS machine consists of a head stock with quick acting chuck mounted on a substantial cast iron bed, with the necessary gearing for direct connection to a motor. The accompanying illustration shows the machine fitted with four cutting-off heads, the gearing referred to being the rear end of the bed. It has a capacity for cutting rounds from 3 in. to 5 in. dia., the bars being fed through the hollow spindle. For the smaller diameter rounds one or two heads are used, and for the larger sizes up to six heads may be employed.

The chuck is air controlled, and the stock is fed through by power operated rolls, which along with a stop are also air controlled. The heads are adjustable on the bed so that slugs of various lengths may be cut, and each head carries three tools, which are fed into the revolving bar by air pressure in the cylinders, one of which is provided for each tool. The air pressure being supplied from a common source and admitted to all of the cylinders simultaneously, all of the tools are put under the same pressure. As the tools vary in sharpness, the sharper ones cut more cleanly and rapidly than the dull ones, which are not crowded into the material as would be the case if fed by positive mechanical gearing.

The resultant freedom from breakage, and increased output due to the proper distribution of the work among the



RAPID PRODUCTION, MULTIPLE CUTTING-OFF MACHINE.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

HEAVY DUTY MANUFACTURING LATHE

A HEAVY duty manufacturing lathe, swinging 20 inches over ways and 11 inches over-bridge, has been placed on the market by H. W. Petrie, Montreal, Ltd. The object aimed at in designing this machine was to provide a lathe which would be capable of producing work at a speed equal to that of larger machines having a greater swing, but without their increased cost and reduced rigidity. By reducing the swing to a size slightly larger than the work, a design is secured which not only possesses all possible stiffness and more convenience of operation, but whose output is limited solely by what the cutting tools will stand when operating on forgings, projectiles and similar work with a finished diameter of 8 in. or less.

Renewable bronze bearings, with ample lubrication, are fitted to all headstock journals. The end thrust bearing is made with hardened steel washers alternating with bronze, and is provided with an adjustment for taking up wear.

The bed is of liberal proportions, the walls being extra thick and tied together by heavy box girths at close intervals. An improved type of wide angle vee on the front shear takes the thrust of the cutting tool, the rear shear being entirely flat. Planed pads on the back of the bed are provided for attaching taper and forming attachments.

The carriage has a width of 12 in. across the bridge, which is made very deep to avoid springing. Lifting of the carriage is prevented by gibbing under the rear of the bed. A double plate type of apron affords a support for both ends of all feed gear shafts. The friction feed is engaged by a hand wheel and seats the friction with slight effort on the part of the operator.

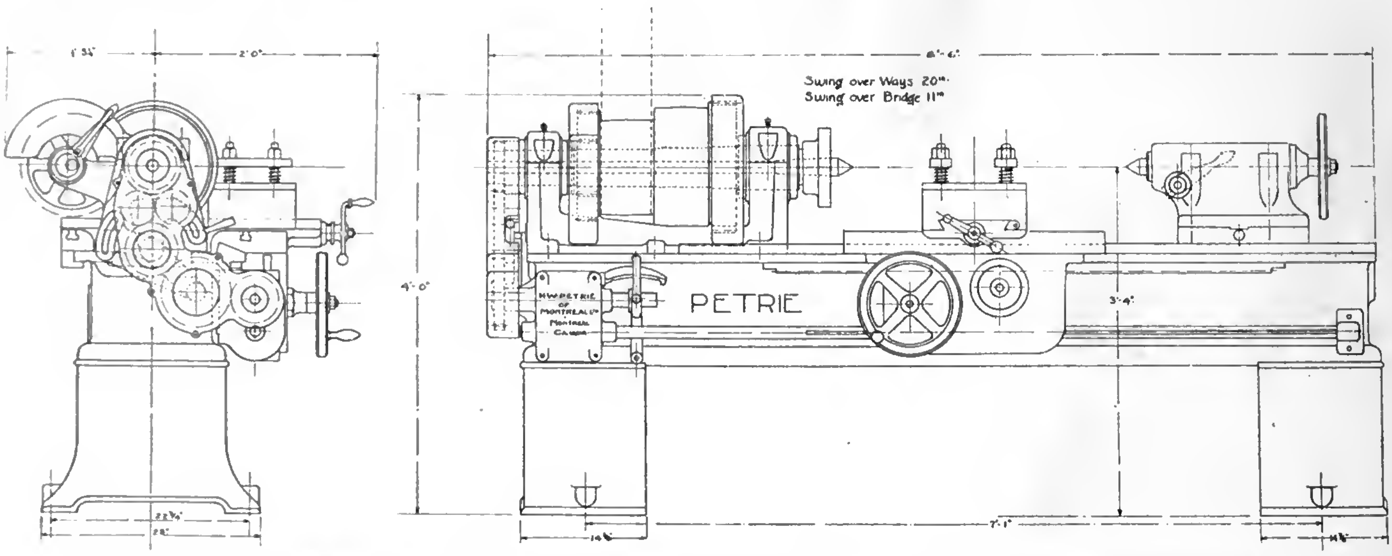
All feeds are positively gear-driven from headstock spindle, three rates of feed—1/8in., 1-16 in. and 1-32 in., being obtained through feed gear of the sliding key type.

The tailstock casting is clamped to the bed by four large locking bolts extending to the top of the barrel. A simple binding clamp is located at the extreme front end of the tailstock, where it grips the spindle with the greatest security and an entire absence of distortion. The spindle screw is of suitable proportions, while a set-over adjustment is provided for taper work.

The standard bed is 8 ft. long, and regular equipment includes one driving plate, heavy duty plain rest, with hand cross-feed, the necessary wrenches and two-speed countershaft.

Extras furnished are forming attachment ,turret tool post, hand or power-feed bed turret, oil pan, pump and connections.

Principal particulars are as follows:—Distance between centres on 8-ft. bed, 40 in.; front spindle bearing, 4 15-16 in. x 6¾ in.; rear, 4 in. x 5½ in.; hole through spindle, 1 5-16 in.; Morse taper centres, No. 5; driving belt, 6 in. wide; back gear ratio, 6.7 to 1; countershaft pulleys, 16 in. x 6¼ in. x 110 revs. per min.; approximate weight, 4,800 lbs.



HEAVY DUTY MANUFACTURING LATHE, SWINGING 20 INCHES OVER WAYS AND 11 INCHES OVER BRIDGE

AUTOMATIC STEAM TOWING WINCH

THE annual outlay for renewing Manila tow-line is an item of considerable importance in the towing business, and any means whereby such expense can be reduced safely and profitably will be welcomed by all engaged in this business.

The Corbet double steam cylinder automatic vessel towing winch has been designed to use steel cable, which has a useful life of many years, this feature, along with the saving of manual labor, resulting in considerable reduction of operating costs.

The machine, two views of which are shown in the accompanying illustration, has accommodation for 1,200 feet of 1-in. steel hawser, which passes through the automatic hawser leader which travels to and fro across the front of the machine, thereby preventing the hawser from climbing on top of itself on the drum. This leader is traversed by means of a shaft having right and left-hand screws, and it is geared to the drum, so that the sideways movement of the leader is in proportion to the speed of the drum. It further enables the hawser to be drawn in when the tug-boat is at any angle with the object in tow.

The entire operation is controlled by one lever, which starts, stops, and reverses, one man operating it with ease. The engine is located between the side frames and consists of two 8 in. x 8 in. cylinders ,operating the drum and spool by a 10 in. diameter pinion on the crank shaft meshing with a 52 in. diameter

gear on the drum shaft, both of 4 in. face. The spool can be operated independently of the drum by means of a friction between the gear and the drum, thereby enabling the winch to serve two purposes at one and the same time.

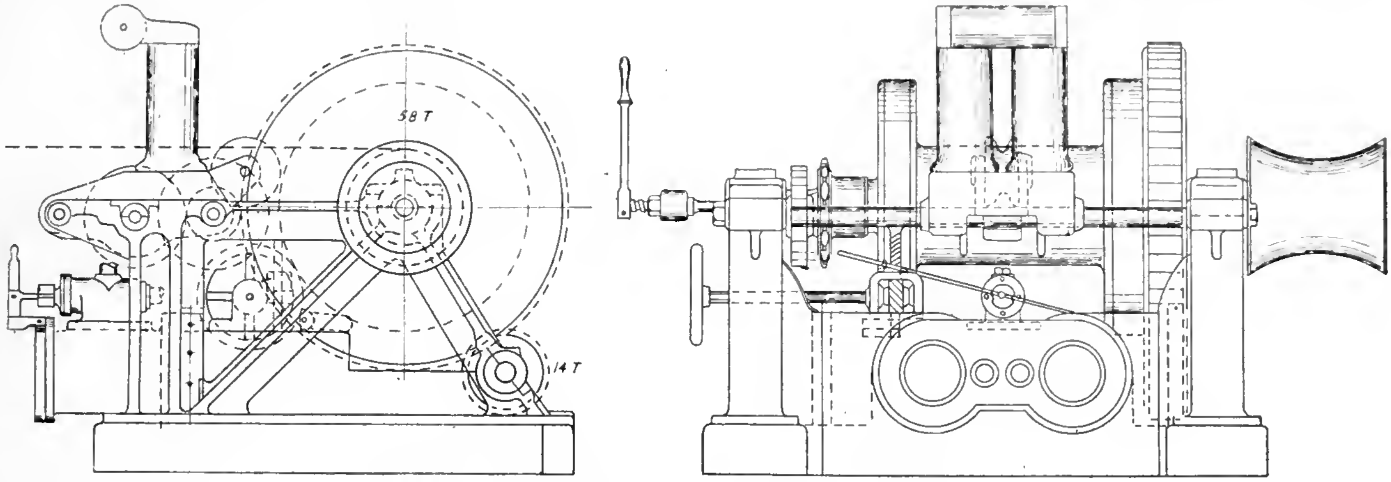
The location of the cylinders to the rear of the drum allows the winch to be placed nearer the centre of the tug, so

Individual electric motor drive is provided, the drive from motor being through silent chain to the gearing which drives the hollow spindle by means of the large spur gear on the end. The spindle admits bars 8 in. diameter, and is provided with a heavy three-jaw chuck.

The bed of the machine is of rugged

the hollow spindle. For the smaller diameter rounds one or two heads are used, and for the larger sizes up to six heads may be employed.

The chuck is air controlled, and the stock is fed through by power operated rolls, which along with a stop are also air controlled. The heads are adjustable on the bed so that slugs of various



STEAM TOWING WINCH WITH AUTOMATIC HAWSER LEAD.

as to facilitate steering, while the whole design is kept as low as possible to reduce the tendency to tip when the tug is at right angles to the direction of the tow. In the case of the largest size machines, this effect is obtained by putting the cylinders outside of the frame, thus allowing the reduced height to be maintained.

The Corbet Foundry & Machine Co., Ltd., of Owen Sound, Ont., are the builders of these winches.

COMBINED CUTTING-OFF AND BORING MACHINE

A COMBINED cutting-off and boring machine, having a capacity for boring shells 8 in. diameter, is shown in the accompanying illustration, being the product of the Newton Machine Tool Works, Inc., Philadelphia.

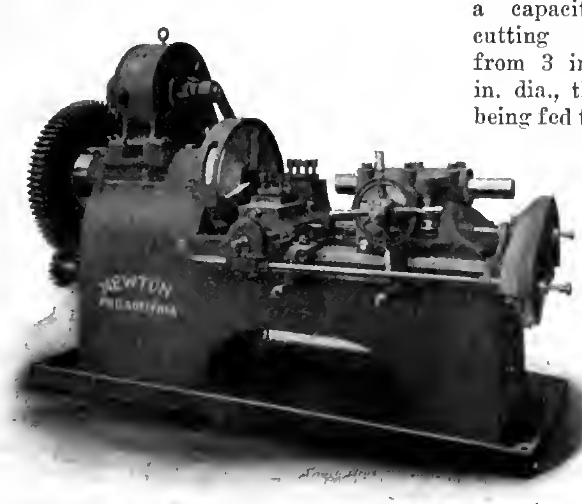
design, and is surrounded by a floor pan. A substantial boring bar carriage, with power feed, is mounted on the bed, which also carries the cutting-off attachment, the feed gears being so arranged that cutting-off and boring are both done at the one operation.

RAPID PRODUCTION MULTIPLE CUTTING-OFF MACHINE

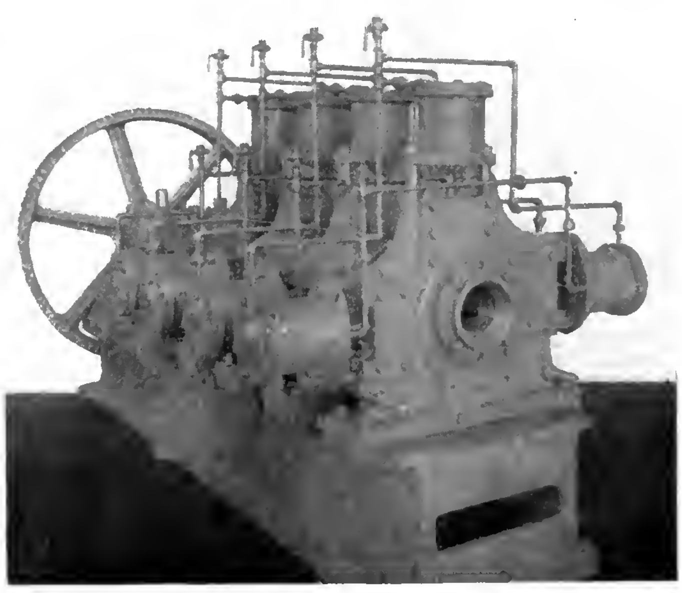
THIS machine consists of a head stock with quick acting chuck mounted on a substantial cast iron bed, with the necessary gearing for direct connection to a motor. The accompanying illustration shows the machine fitted with four cutting-off heads, the gearing referred to being the rear end of the bed. It has a capacity for cutting rounds from 3 in. to 5 in. dia., the bars being fed through

lengths may be cut, and each head carries three tools, which are fed into the revolving bar by air pressure in the cylinders, one of which is provided for each tool. The air pressure being supplied from a common source and admitted to all of the cylinders simultaneously, all of the tools are put under the same pressure. As the tools vary in sharpness, the sharper ones cut more cleanly and rapidly than the dull ones, which are not crowded into the material as would be the case if fed by positive mechanical gearing.

The resultant freedom from breakage, and increased output due to the proper distribution of the work among the



ROTARY CUTTING-OFF AND BORING MACHINE.


RAPID PRODUCTION, MULTIPLE CUTTING-OFF MACHINE.

tools makes these machines very efficient. 3 in. bars being cut in thirty seconds and 5 in. bars in ninety seconds. The total number of slugs produced in these times depends of course on the member of heads employed.

The machine has been developed by the Southwark Foundry & Machine Co., Philadelphia, Pa., and in the design shown required approximately 15 to 20 horse-power per head employed. A number of sizes are built, the largest having a capacity from 9½ in. to 14 in. diameter, producing six slugs of the smaller size in 4½ minutes, and the larger size in 10 minutes. This machine has a bed 15 ft. long and requires a 125 hourse-power motor to operate it.

NEW MARKET FOR ASBESTOS

THE effects of the war are being revealed in some surprising situations. Before the outbreak of hostilities, over 50 per cent. of Canada's asbestos found its way into Germany and Austria, and as a result when war broke out the two big asbestos corporations doing business in Canada found matters almost at a standstill.

In a surprisingly short time they found a new and larger market for their entire output with the result that the Asbestos Corporation of Canada shows an increase of 12½ per cent. over its sales for 1914, while the Black Lake Asbestos Co. turned a deficit of $32,000 in 1914 into a profit of $20,000 in 1915.

Previous to the war, asbestos was used very largely for industrial purposes, such as the making of shingles, fireproof boards, fireproof curtains for theatres, covering for machinery, etc., etc. To-day Canadian asbestos is finding a market in Great Britain where it is being used as packing in guns, for the covering of boilers and piping in the many new ships which are being built as well as for other purposes associated with war.

After practically closing up at the outbreak of the war, our asbestos companies are now working overtime in an effort to supply the demand, but so far have not been able to produce enough to overtake the market requirements of Great Britain.

It is somewhat significant of German tacties that shortly after the outbreak of the war, one of the companies operating in Canada was requested by its former German customer to ship large supplies to a firm in Holland. Needless to say, the other was not filled.

DOMINION RAILWAY SUBSIDIES

WHAT Canada has paid its three transcontinental lines in the way of subsidies or bond guarantees was told to the House of Commons, Ottawa, on Feb. 23, in replies given by the Acting Minister of Railways, Hon. Dr. Reid, to questions by Mr. Jameson (Digby). The total amount paid by way of subsidies to the Canadian Paific Railway is $30,369,374; in land grants, 19,816,010 acres, and in bond guarantees, $3,093,700, asumed directly by the Government, December, 1906.

To the Canadian Northern Railway the total cash subsidy has been $26,155,360, and land subsidies, 3,422,528 acres. The bond guarantees have been as follows: 1903, £1,923,287 three per cent. bonds; 1908, £1,622,586 three and a half per cent. bonds; 1910, £647,260 three and a half per cent. bonds; 1911, £7,493,835 three and a half per cent. bonds; 1912, £733,561 three and a half per cent. bonds; 1914, $45,000,000 four per cent. bonds. Of this list mentioned bond guarantee, the C. N. R. has sold securities valued at $17,500,000, and a portion of the remainder has been pledged for purposes set out under the act.

To the Grand Trunk the only subsidy paid was $500,000 for the Victoria Jubilee Bridge. There have been no land grants, and no bonds guarantees.

This makes a total of a little more than $57,000,000 in direct cash subsidies, while land subsidies total more than 22,000,000 acres, and bond guarantees approximately $124,000,000, of which the share of the C. N. R. is about $110,000,000.

THE MARINE FREIGHT RATE SITUATION

IN the British House of Commons on February 17, a score of members attacked the Government method of dealing with the mercantile marine. Arthur J. Balfour, First Lord of the Admiralty, and Walter Runciman, President of the Board of Trade, replied to the attacks, and explained that while the situation was admitted to be far from satisfactory, the Government was doing its utmost to make things better.

Our Mercantile Marine Task

The complaints of the members of Parliament were mainly to the effect that the high freight rates were largely due to waste of tonnage caused by Government mismanagement. Mr. Runciman, in reply said:

"The shipping difficulties of the present time are due not to mismanagement, but to our trying to pour a quart into a pint pot. This and nothing else. The general upward tendency of ocean freights is caused by the fact that the mercantile marine, which is limited in size, has to carry out a task far greater than in time of peace. The shipping problem has become the greatest economic problem of the day. Where we had a hundred ships before the war, we must now do with 67, of which 24 are under neutral flags.

Dependence on Neutral Ships

"We are dependent to an enormous extent on the services of neutral shipping, and if we drive it away by any system of low maximum rates, or a similar device, we shall starve. If we fix maximum rates below the world level we shall drive neutral shipping to ports where higher rates are obtainable.

"There has been no laxity in management or control on the part of the Government. The Board of Trade has made the largest possible use of expert advice. Lord Curzon's committee has control of shipping to the fullest extent. In fact, the control is now so wide and adequate that no British vessel can go anywhere or trade anywhere without permission of one kind or another.

Will Alleviate Difficulties

"Certain steps are being taken to alleviate the difficulties of the shipping problem. The first necessity is to get rid of the congestion in our ports, and measures are now under way to achieve this. Then there is shipbuilding, in which respect the navy has been the greatest competitor of the mercantile marine. The Admiralty has, however, already permitted us to build forty-five merchant ships, while a number of others which are under construction have now been classified as war work. We also have done a little to make ends meet by restricting imports."

A. J. Balfour, First Lord of the Admiralty, said he thought ship owners could not complain of hardships, as rates were not only high, but preposterously and dangerously high. He denied that Great Britain was acting selfishly regarding tonnage or making money out of the allies, arguing that a country which prepared to deprive its people of certain imported goods in the interests of an efficient working merchant service could not be accused of acting selfishly.

Referring to waste, Mr. Balfour thought that matters might be improved by giving commercial training to admirals and generals, but that was a matter of a lifetime. It was not through any action of the transport department that there was a shortage of tonnage, he declared, and whatever might be said about the policy of temporary Governmental appropriation of the whole shipping strength of the country's mercantile marine, he hoped nothing would be said in criticism of the navy in this connection.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors.

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.
H. C. FOGARTY.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. MARCH 9, 1916 No. 10

THE NEW TAXATION FOR WAR PURPOSES

THE changes in the original war taxation proposals of Canada's 1916 Budget which Sir Thomas White, Finance Minister, announced in the House of Commons on March 2, are such as to merit and receive to a large extent the whole-hearted approval of the parties interested, the retroactive and capitalization features having been modified and brought to a more equable basis of assessment respectively.

The retroactive period has been advanced to January 1, 1915, tax payments falling thereby in the individual years 1916, 1917 and 1918. Capital will be taken as the actual unimpaired reserves of each company or corporation, and watered stock will be eliminated for taxation purposes by taking the cost value of the stock on January 1, 1915, and deducting from same the liabilities of the company or corporation on that date.

Other modifications are, that holding companies will not be taxed on profits received from their subsidiaries when the latter pay under the Act, and all concerns who may make tax payments to Great Britain or her Allies will have the amount of same deducted from that otherwise payable to the Dominion Government. As regards non-Canadian concerns, the capitalization basis of assessment will be such portion of the amount paid upon their entire capital stock as the value of the Canadian assets bears to the total assets.

OUR MUNITIONS MANUFACTURING PROGRESS

IN spite of the manifest disposition by interests for the most part, if not wholly, out of touch with the munitions situation existent to-day in Canada, to belittle the work and achievement of our Imperial Munitions Board, it can be authoritatively stated that at no time since shell manufacture was inaugurated here, has the administration feature been so comprehensive in its scope and effective and efficient in securing satisfactory results. We are in a position to affirm that absolute harmony prevails within the Board and that in matters of management of contracts placed by the predecessors of the latter, and in securing and distributing additional British orders, the administration is at once well ahead of its work, and fully organized to meet and handle any contingency demand that may be made upon it—satisfactory alike to the British Ministry of Munitions and to our own manufacturers.

Scarcely a day passes, we are advised, without orders from Britain for munitions of one sort or another, large and small, being received, abundant evidence surely of the missionary activity that characterizes the personnel of the Board. These orders are for the most part urgent as regards delivery—this being natural. As a result, it is of the utmost importance that our manufacturers be not only in intimate touch with what is transpiring, but be, in addition, prepared to take advantage of these offerings by preparedness of equipment. Quite recently orders were received from Britain for a particular size and type shell with which many of our metal-working plants are not unfamiliar relative to production; unfortunately, however, plant congestion, due to similar shells previously ordered precluded any possibility of Canadian concerns securing a contract, with the result that the orders went to the United States.

Much has been made of this circumstance of British munitions orders being so placed, not alone with respect to the foregoing instance, but with respect to many others, and it may possibly be urged that while those firms engaged in the production of the particular size and type shell referred to were meantime and for some considerable time to come taxed to their maximum output capacity, other firms with shell experience and at the moment operating more or less below capacity might have been favored. We are apt to forget, however, that such reasoning falls short of meeting a normal situation—much less does it provide for urgency of delivery.

It is a well-known fact that we have got well past the experimental stage of shell-making, that shell prices—any size and type, do not now carry the substantial profit margin of the initial and immediately succeeding contracts to cover factory extension and equipment installation. The plants therefore which were equipped to make the particular shells recently required were of course the only probables in the matter, and if they found it impossible to take on the work as stipulated, there was little use in others not properly equipped even considering contracts.

It may interest our readers to know that munitions contracts amounting to two hundred million dollars, placed at various periods as far back as eleven or twelve months ago, still await completion, and that as a result of conferences held between Sir Thomas White, Dominion Minister of Finance, Ottawa, the Imperial Munitions Board, and our leading bankers, arrangements have been practically concluded whereby the latter will extend a credit of $75,000,000 to the British Government, and further munitions contracts for Canada amounting to in the neighborhood of $100,000,000, will become available as a result.

In another section of this issue some interesting data will be found covering the first of the new "loading" factories to be established in Canada by the Imperial Munitions Board. From the details given it will be abundantly evident that neither indifference to nor ignorance of our national industrial possibilities much less incapacity to take hold of every opportunity offering, may be charged to that body.

We may not at this stage say more, either concerning further developments advantageous to our metal-working industries or relative to other and intensely interesting war-time manufacturing activities now in progress. Enough has been said, we believe, to show that the efforts and energies of those, to whom has been deputed the task of bringing Canada's metal-working industries into line for filling the requirements of our Empire, to the mutual benefit of all concerned, have been brimful of highly progressive and satisfactory results.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Montreal.	Toronto.
Grey forge, Pittsburgh		$18 45
Lake Superior, charcoal, Chicago		19 75
Michigan Charcoal iron.		28 00
Ferro nickel pig iron (Soo)		25 00
Middlesboro, No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1.......	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain ..	26 00	24 00
Hamilton, No. 1	26 00..	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto........	2.75
Steel bars, 2 in. and larger, base..	4.00
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill....	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh....	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	3.00
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	2.90
Structural shapes	2.90
Plates	3.15

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload ..	$31 00	$30 50
Electrolytic copper	31 00	30 50
Castings, copper	30 00	30 00
Tin	48 00	50 00
Spelter	23 00	23 00
Lead	8 25	8 50
Antimony	48 00	48 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in., lb...	$3 40	$3 40
Heads ,per 100 lb.	3 65	3 65
Tank plates, 3-16 in.	3 70	3 70

WROUGHT IRON PIPE

Prices in effect Feb. 18, 1916

Buttweld

Per 100 feet	Black	Galv.
1/4 and 3/8 in.	$ 2 64	$ 4 41
1/2 in.	3 32	5 14
3/4 in.	3 91	6 38
1 in.	5 78	9 44
1 1/4 in.	7 82	12 77
1 1/2 in.	9 35	15 26
2 in.	12 58	20 54
2 1/2 in.	19 89	32 47
3 in.	26 01	42 46
3 1/2 in.	31 28	51 06
4 in.	37 06	60 50

Lapweld

	Black	Galv.
2 in.	14 06	22 02
2 1/2 in.	20 48	35 05
3 in.	26 78	43 22
3 1/2 in.	32 20	51 98
4 in.	38 15	61 59
4 1/2 in.	48 26	75 57
5 in.	56 24	88 06
6 in.	72 96	114 24
7 in.	99 96	153 50
8 in x 25 lbs. per ft.	105 00	161 25
8 in.x28 lbs. per ft..	120 96	185 76
9 in.	144 90	222 53
10 in.x32 lbs. per ft..	134 40	206 40
10 in.x40 lbs. per ft..	173 04	265 74

Ontario list—All points from Kingston and west to, but not including Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
1/4 in. and 3/8 in.....	$ 2 58	$ 4 35
1/2 in.	3 23	5 06
3/4 in.	3 80	6 27
1 in.	5 61	9 27
1 1/4 in.	7 59	12 54
1 1/2 in.	9 08	14 99
2 in.	12 21	20 17
2 1/2 in.	19 31	31 88
3 in.	25 25	41 69
3 1/2 in.	30 36	50 14
4 in.	35 97	59 41

Lapweld

	Black	Galv.
2 in.	13 69	21 65
2 1/2 in.	19 89	32 47
3 in.	26 01	42 46
3 1/2 in.	31 28	51 06
4 in.	37 06	60 50
4 1/2 in.	46 99	74 30
5 in.	54 76	86 58
6 in.	71 04	112 32
7 in.	97 58	151 13
8 in. x 25 lbs. per ft..	102 50	158 75
8 in. x 28 lbs. per ft..	118 08	182 88
9 in.	141 45	219 08
10 in. x 32 lbs. per ft.	131 20	203 20
10 in. x 40 lbs. per ft.	168 92	261 62

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 75	$17 75
Copper, crucible	21 00	21 00
Copper, unch-bled, heavy	20 75	20 75
Copper wire, unch-bled .	20 75	20 75
No. 1 machine compos'n	16 25	16 25
No. 1 compos'n turnings	13 50	13 50
New brass clippings ...	13 50	13 50
No. 1 brass turnings ...	11 25	11 25
Heavy melting steel....	9 00	10 00
Boiler plate	11.75	19.00
Axles, steel	13.00	15.00
Axles, wrought iron	18.00	19.00
Tires, steel	11.75	10.50
Rails	13.00	13.00
Shafting	15.00	16.00
Malleable scrap	10.00	12.00
Pipe, wrought iron	9 50	9 00
Stove plate	9 50	8 50
No. 1 wrought iron	13 75	11 00
No. 1 machin'y cast iron	14 75	14 00
Heavy lead	6 00	6 25
Teal lead	5 00	5 25
Scrap zinc	15 50	15 50
Aluminum	34 00	34 50

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	60
Stove bolts	72 1/2
Plate washers	35
Machine bolts, 3/8 and less	52 1/2
Machine bolts, 7-16 and over....	42 1/2
Blank bolts	42 1/2
Bolt ends	42 1/2
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron....	25
Machine screws, fil. head, brass..	5
Nuts, hexagon, all sizes ..	2 3/4c per lb. off
Nuts, hexagon, all sizes..	3c per lb. off
Copper rivets and burrs, list plus	15
Burrs only, list plus	30
Iron rivets	60
Boiler rivets, base, 3/4-in. and larger	$4.35
Structural rivets, as above	4.10
Wood screws, flathead, bright	85
Wood screws, flathead, brass	50
Wood screws, flathead, bronze	45

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws.....	45%
Flat & But. Head Cap Screws....	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$37 00
Open-hearth billets, Pittsburgh	38 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	50 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 20	$3 15
Cut nails	3 15	3 20
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	$3 75	

MISCELLANEOUS

Solder, guaranteed	0.28½
Solder, strictly	0.26¾
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.37
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	11.70
Red dry lead, 100-lb. kegs, per cwt.	11.50
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.30½
Benzine, single bbls., per gal.	.030
Pure turpentine, single bbls.	0.78
Linseed oil, raw, single bbls.	1.02
Linseed oil, boiled, single bbls.	1.05
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	6.00
Lead wool, per lb.	0.12
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	55
Standard drills over 1½ in.	30
3-fluted drills to 1½ in.	30
3-fluted drills over 1½ in.	20
Bit stock	65
Ratchet drills	30
Machine bits for wood	30 and 5
S.S. drills for wood	55
Wood boring brace drills	40
Electricians	35
Sockets	55
Sleeves	55
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	10
Drills and countersinks	5
Bridge reamers	55
Centre reamers	15
Chucking reamers	15
Hand reamers	15 and 5

High speed drills and reamers are double the list price plus 20 per cent.

COLD ROLLED SHAFTING

At mill	10%
At warehouse	Net

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped unions, 65.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$3 75
Canada plates, dull, 52 sheets	4 50	4 00
Canada Plates, all bright	6 30	5 25
Apollo brand, 10¾ oz. galvanized	6 75	6 75
Queen's Head, 28 B.W.G.	7 25	7 25
Fleur-de-Lis, 28 B.W.G.	7 00	7 00
Gorbal's Best, No. 28	7 25	7 25
Viking metal, No. 28	7 00	7 00
Colborne Crown, No. 28	6 75	6 75
Premier, No. 28, U.S.	6 65	6 65
Premier, 10¾ oz.	6 90	6 90

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.35
⅜ in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
⅝ in.	6.35
¾ in.	6.15
⅞ in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$14.00
3-16 in.	10.45
¼ in.	7.15
5-16 in.	5.65
⅜ in.	4.60
7-16 in.	4.60
½ in.	4.60
⅝ in.	4.45
¾ in.	4.45

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	72½
Kearney & Foot, Arcade	72½
J. Barton Smith, Eagle	72½
McClelland, Globe	72½
BlackDiamond	60-7½
Delta Files	72½
Nicholson	72½
Globe	72½
Vulcan	70-10
Disston	70

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$18 70	......
1¼ in.	18 70	......
1½ in.	18 70	12 70
1¾ in.	22 00	12 70
2 in.	22 00	12 10
2¼ in.	24 20	13 30
2½ in.	26 40	15 95
3 in.	35 20	16 06
3½ in.	40 00	19 80
4 in.	44 00	25 30

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.23
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	.04¾
Lard oil, per gal.	1.28
Thread cutting oil	.54
Imperial quenching oil	.38
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.15¼
Peerless	.15¼
Grand	.14¼
X L C R	.13¼
Atlas	.13¼
X Empire	.12¼
X press	.11¼
COLORED.	
Lion	.09½
Standard	.08¾
No. 1	.08¾
Popular	.07¾
Keen	.06¾
WOOL PACKING.	
Arrow	.20
Axle	.15
Anvil	.11
Anchor	.09
WASHED WIPERS.	
Select White	.09
Mixed Colored	.07
Dark Colored	.05½

This list subject to trade discount for quantity.

COPPER SHEETS

	Montreal	Toronto
Bars, ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 in.	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$11 50	$11 50
Sheets, 3½ lbs. sq. ft.	10 30	10 30
Sheets, 4 to 6 lbs. sq. ft.	10 75	10 75

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.32 to .33
Tin	.48 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs	.07 to .08
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09

Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy	.35
Copper sulphate	.22
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., March 7, 1916.—The gradual upward movement of all steel and steel products is the outstanding feature in the abnormal situation at present prevailing throughout the metal working industries. Conditions are such that it is impossible for anyone to predict the extent to which the prices of steel will ultimately advance. In the opinion of certain American authorities, future developments may prove that the apparent high level of to-day will not only be surpassed, but will appear low in comparison with future conditions.

The activities in every branch of metal working industries continue with unceasing energy.

Pig Iron

The local situation is unchanged, with business generally reported good. A general advance of 50 cents is noted on all grades of American iron. No change of price is reported from Montreal dealers.

Steel

The demand for steel of all kinds and grades remains abnormal. Prices of manufactured steel continue to increase and the climax is not yet in sight, and further advances may be expected in the very near future. Current quotations show an advance on unfinished steel, f.o.b. maker's mill Pittsburg, of $3 a ton on Bessemer billets and sheet bars; $2 a ton on open-hearth billets and sheet bars. Forging billets and wire rods have advanced $5 a ton, being quoted at $60 for billets and $55 for wire rods, Pittsburg. However, local dealers have not advanced their prices yet, but suggest that a change may be made at any time, as all prices on steel goods are nominal. Light rails are quoted $3 a ton higher. Iron bars have advanced $2 to $3 a ton, the Chicago price being now $40. Tank plates are up 2-5 cents a pound, and structural shapes are 1-10 cent higher. The prices on black and galvanized sheets have advanced 10 cents a hundred. Pittsburg prices for wire products are 10 cents per hundred higher. Cold rolled strip steel is now quoted at $5 to $5.50 Pittsburg; this is an advance of 1½ cents a pound. Montreal quotations are expected to advance soon in many lines.

Metals

The general situation in the metal markets remains unchanged, and conditions are comparatively quiet. Copper has, during the past week, shown slight signs of weakness, and in some instances quotations have fallen off a little, but it is not considered probable that any pronounced decline will result from this weakness. A feature of the week's market was the sudden jump in the price of tin to 50 cents, New York. However, the advance was of short duration, and quotations are again firm at last week's figures. Spelter is not active, and foreign markets are unsettled. London reports an advance, while United States quotations are lower than last week. The price of lead has again advanced in the States, but quotations here are unchanged.

The London and Glasgow metal markets have reopened for business in all metals. With the exception of tin, trade in the metals had been suspended awaiting the result of a conference between the members of the exchange and the Munitions Minister. The regulations referred to will not be enforced until the metal purchased reaches the home market. Export orders and sales to allied or neutral countries through authorized channels will be treated as consumers' orders.

Copper.—Quiet prevails in the market, and the dullness has had a tendency to lower prices, but as producers are, in most cases, sold well ahead, the prices are remaining firm, as the general situation is practically unchanged.

It is reported that German interests have closed orders for 2,500 tons at 26½ cents, to be delivered at New York warehouse during the last quarter. This metal to be shipped to Germany at the termination of the war. The local situation is unchanged, with prices firm.

Tin.—The quotation on tin about ten days ago reached the high figure of 50 cents, New York. Several sales are reported to have been made at 48 cents during the recent decline from the sudden advance above noted.

Montreal dealers are holding firm in their prices of 48 cents. Recent sales were reported by one dealer at 46 cents per pound.

Spelter. — The situation in spelter is showing signs of weakness and the market at present is very quiet. The Lon-

don market however, has steadily advanced until a week ago, spelter was quoted at £110, a figure never exceeded on the British market. Trading in this country is dull. An interesting fact of present conditions being the increase in the number of sellers now on the market. The possibility of an unlooked for supply of spelter is causing some uneasiness among buyers, and consumers are undecided upon placing future orders.

No change is recorded in local conditions and dealers are quoting the nominal figure of 23 cents per pound.

Lead.—The United States market is becoming stronger and an advance of $2 a ton has just been added. The Trust price of lead is slightly lower than independent producers. Local conditions are unchanged with quotations nominal at 8¼ cents per pound.

Aluminum.—The trade is reported as quiet with no change in the general situation. Very little metal is available for spot or early delivery as producers are booked several months in advance. No change is reported in local conditions by Montreal dealers and prices are firm at 68 cents per pound.

Antimony.—The situation is quiet and prices remain unchanged at 48 cents per pound.

Machine Tools and Supplies

The situation in this branch of industrial activity remains unchanged, and while the demand is not as great as some time ago, there is still considerable inquiry for certain tools required in munition factories.

The near approach of May Day is causing some uneasiness among machine tool builders, and it is expected that some trouble may eventuate, thus affecting to some extent the production of machines and accessories.

The demand for supplies continues heavy and it is often difficult to get sufficient to meet the needs of the factories. The price of gasoline is constantly advancing and this may go still higher as the approach of spring will doubtless increase the demand. Oils are very strong and prices are going up.

Old Materials

Quiet prevails in the scrap metal market and very little trade is reported. Prices on most of the metals are unchanged. Wrought iron pipe, with an advance of one cent is quoted at 9½ cents per pound. Stove plate scrap shows a similar increase and quoted at the same price, while No. 1 wrought iron has advanced to 13¾ cents, being an increase of 2 cents per pound.

Calgary, Alta.—J. C. Boyle, of this city, will build a large packing plant here at an estimated cost of $250,000.

Toronto, Ont., March 7.—The business tax resolutions have been amended by the Minister of Finance and the terms are now more specific although further revision may be necessary to insure equable application of the proposed tax. Trade generally continues active and collections have improved considerably. The outlook for business is good, but the steady increase in cost of raw materials is affecting the situation and creating a feeling of uncertainty among manufacturers. The cost of production is increasing, with the result that prices of practically all finished goods are advancing. Trade is being seriously hampered by the shortage of tonnage and high ocean freight rates, with no prospect of any immediate relief. Shipments are not only being delayed but the prices are being materially increased on this account. Satisfactory progress is being made toward providing credits to help finance the purchase of munitions by the Imperial Government in Canada. This means that further large orders for munitions will be placed with Canadian manufacturers. These orders in addition to those already in hand will keep the plants busy for the rest of the year.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Steel Market

There is no change in the situation and the upward trend of prices continues with no indication that the top of the market has been reached. The mills have more orders than they can handle and deliveries are getting further behind. Boiler plates have advanced 15c and are now quoted at $3.40, heads $3.65, and tank plates 3-16 in, at $3.70 per 100 lbs. Boiler tubes are unchanged but higher prices are anticipated as an advance of $2, per ton has recently gone into effect in the States. Prices of shafting are very firm and an advance is probable. There is a heavier demand for shafting in the States than was ever known and deliveries are now being extended from six to eight months from date of order. Wrought iron and galvanized pipes are firm and higher prices are looked for following an advance of $2 per ton at Pittsburgh. Other products which have been advanced in the States and which may affect the local market include wire products, $2 per ton, shafting $5, spikes $2 to $3, cold rolled strip steel $5 per ton. These advances show that the general trend of the market affects all products at one time or another. There is no change in the galvanized sheet situation, prices are very firm and are expected to advance.

The market in the United States is very strong and the price changes given above are only a few of the advances that have been made during the week. There is nothing in sight as yet to indicate any halt in demand or in advance in prices, on the contrary, all signs point to higher levels. The mills are so congested with business that they are unable to satisfy customers in deliveries. Steel bars are unchanged at 2.50c, plates at 2.75c, and beams at 2.25c, Pittsburgh. Shortage of the supply of semi-finished steel has resulted in further prices. Bessemer billets are now quoted at $37, and open hearth billets at $38; Pittsburgh forging billets are unchanged at $55, and wire at $50, Pittsburgh. Prices of wire rods are however purely nominal as some makers have not been selling in the open market except to regular customers for several months.

Pig Iron

There is no change in the pig iron situation and prices remain at last week's level. The market is fairly active with an improved demand for foundry grades of pig iron.

Old Materials

The situation in the scrap metal market is much the same as last week. A steady volume of business is reported for brass, copper and heavy melting steel, the market for these metals is firm and quotations unchanged. The recent advances in the pig lead market have improved the position of old lead and prices are a little stronger. Aluminum is also strong but scrap zinc is weaker. Boiler plate, axles, tires, etc., have all an upward tendency but quotations are unchanged meantime.

Machine Tools

The market is keeping steady with a fair demand for machine tools, principally in replacements for munition plants. There are signs that ordinary business is picking up although the main demand is still for shell-making tools. A number of makers of machine tools in the States recently advanced their prices about 10 per cent. Prices may now be said to be approximately 25 to 50 per cent. higher than they were a year ago. Although the demand for machine tools is quieter than it was, the export demand having fallen off considerably, the cost of production has increased and prices of machinery will

therefore keep at the present high level for some time to come.

Supplies

The market is keeping steady with fewer price changes than usual. Coe's monkey wrenches are higher, the new discount being 20 per cent. as against 36 per cent. formerly. Lead wool is now 12c per pound being an advance of 1c. Cordage prices are unchanged but very firm, and higher levels may be looked for. Leather belting is also expected to advance. Castor oil has advanced 1c and is now 45c per pound. Black oil has also advanced and is now quoted at 14½c per gallon. Lead sheets are higher, 3 lbs. being quoted at 11c; 3½ lbs. at 10½c; and 4 to 6 lbs. at 10¾c per pound. Both the turpentine and the linseed oil markets are weaker with quotations unchanged.

Metals

An important development has taken place on the London market during the week. The British Government last Thursday issued regulations prohibiting speculative transactions in the various metals required in the production of war material. The object of the new orders was to prevent inflation in prices and was due to the high prices reached in all the markets. The metals covered in the order included among others, copper, zinc, brass and antimony. Tin was not included in the order as it only enters incidentally in the manufacture of munitions. If this regulation had been enforced for any length of time it would have meant a virtual stoppage of trading operations of the London market and would have also stopped all manipulation and speculation. At this writing, however, cable dispatches state that the regulation has been rescinded, but no information is to hand as to the reason of the Government's action. We understand that the metal exchanges in London opened Monday for trading under conditions authorized by the Minister of Munitions. Although the regulations are not in force, it indicates that the British Government intend to control prices of metals more effectively than heretofore, and the effect of this will be felt locally by less fluctuation in prices. The American market has invariably followed London so it will be interesting to see how prices in New York are affected under the new arrangement.

Copper

The market is unsettled following developments in London, but quotations are unchanged. The demand for copper is still exceptionally strong and producers are so well sold ahead that they do not find it necessary to reduce prices. Indications point to the present high level being more or less maintained for some months as there is a possibility of the consumption increasing rather than decreasing. Quotations are nominal at 30½c per pound.

Tin. — The sharp advances reported last week has not been maintained and the market has declined. As tin was only metal not included in the British Government regulations, later rescinded, this metal will perhaps not be affected by other restrictions on metals generally that may be imposed by the Minister of Munitions. The tin position is a good one, particularly for spot metal. Tin is now quoted at 50c per pound.

Spelter.—The market is unsettled and weaker being affected by the London market. There appears to be a wide difference of opinion in the trade as to what effect the action of the British Government will have on prices, and many consumers are holding back until the situation develops. Zinc ore is quoted at $100 to $120 at Joplin, Mo. Spelter has declined 2c locally and is now being quoted at 23c per pound.

Lead.—The market is strong following an advance by the "Trust" of $2 per ton, being quoted 6.40c New York, with the outside market at 6.50c to 6.60c. There is a scarcity of spot lead but the demand continues good. Local quotations firm and higher as 8½c per pound.

Antimony.—The market is quiet and unchanged. The antimony market has been under the control of the British Government for many months so that new regulations or restrictions would have little effect. Quotations are unchanged at 48c per pound.

Aluminum.—The market is strong and the metal is scarce. Quotations are firm but unchanged at 68c per pound.

Solders.—Quotations are a little easier than last week following the decline in the tin market. Guaranteed is quoted at 28½c and strictly at 26¾ per pound.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

CANADIAN TRADE SHOWS LARGE GAINS

FIGURES of Canadian trade for the first ten months of the fiscal year, as issued by the Customs Department on February 23, show a remarkable increase in exports as compared with the corresponding period of 1914, while imports also show a small gain. For the ten months ending with January, exports of domestic products totalled $595,265,000, an increase of $260,847,000, or nearly 80 per cent. as compared with the preceding ten months. Imports totalled $394,093,000, an increase of $15,046,000. The balance of trade for the ten months is a little over $200,000,000 in Canada's favor.

The total trade in merchandise for the ten months has been nearly $990,000,000, an increase of $275,000,000 as compared with the corresponding ten months of 1914-15.

Big crops and war orders account in the main for the phenomenal increase in exports. The exports of agricultural products for the ten months totalled $218,000,000, an increase of $104,000,000, or nearly 100 per cent. as compared with the preceding year and reflecting last year's big crop and the high prices obtained for it. Exports of manufactures for ten months totalled no less than $166,000,000, an increase of $105,000,000. This big jump in the export of manufactures is ,of course, mainly due to war orders, a considerable part of which Canada must herself pay for in taxes.

Other branches of export also show satisfactory gains. Exports of the mine for the ten months totalled $53,682,000, an increase of $11,000,000; exports of animals and their produce totalled $88,763,000, an increase of $24,000,000; exports of the forest totalled $45,428,000, an increase of $9,000,000; exports of fisheries totalled $18,541,000, an increase of nearly $3,000,000.

FERROMANGANESE EXPORTS FROM GREAT BRITAIN

BRITISH exports of ferromanganese, spiegeleisen and ferrosilicon in 1915 are officially reported at 103,077 gross tons, but probably most of this was ferromanganese. In 1914 these exports were 111,788 tons and in 1913 they were 173,919 tons. Of the 103,000 tons exported in 1915, the United States received only 55,201 tons, showing that considerable quantities went to other countries.

In 1913 about 10,000 tons was imported from Germany by the United States.

PAPER INDUSTRY ACTIVE

CANADIAN paper mills, according to trade authorities, are experiencing a strong demand for all lines of their output, the demand being in part a natural sequel of the strong market that has developed in paper in the United States. Exports of newsprint from Canada in November, according to the latest statistics available, were valued at $1,753,013, a new high record for any month, and of the total more than $1,400,000 went to the United States. Chemically-prepared pulp has been notably strong recently. With exports rising and imports virtually cut off, American paper authorities are talking now of a paper famine in the United States. As long as this condition continues Canadian mills can count on a continuance of the present capacity operations.

CANADA'S WEALTH

AN official estimate of Canada's wealth has never been prepared, says a writer in the Journal of the Bankers' Association of Canada. Our Census Bureau is not required, as the United States Bureau is, to make such a compilation each decade. From the very nature of our development and of our fiscal systems, it is harder for unofficial estimaters to compute the total than in the case of other countries. However, a rough, provisional estimate may be attempted. Only primary or tangible wealth is included; claims to tangible wealth in Canada itself, such as mortgages or stock, would, if included, clearly mean counting double.

Wealth of Canada

Farm values (lands and buildings), 1911 census	$ 3,343,000,000
Mines and forests based on value of products), 1911	800,000,000
Steam and electric railways (15 times net earnings)	1,125,000,000
Urban real property, 1914	3,000,000,000
Manufacturing machinery	300,000,000
Live stock and implements, 1911	888,000,000
Stocks of raw materials and manufactured goods, 1911	800,000,000
Household furnishings, clothing, carriages, motors, etc.	600,000,000
Specie, 1914	160,000,000
Investments abroad, railways, public utilities, etc.	100,000,000
	$11,160,000,000

PANAMA CANAL SUSPICIONS

THERE is an uneasy feeling that the closing, or continued closing, of the Panama Canal is not due to "natural causes," says the Practical Engineer of London, England. The waterway has now been closed since the beginning of October, except for a few small ships allowed to pass. The first estimate of reopening was Nov. 1, the second estimate was about Jan. 1, and finally came the gushingly worded announcement, that although there is now a free way for ships they will not be allowed to pass. The reason given is that they could only pass by delaying the work of the dredgers, and that it is in the best interests of all to keep the dredgers at work till they have made a satisfactory clearance. The cause of the suspicion is that some ships bound for Vladivostock with war supplies for Russia are held up in the Canal and that it is to the German interest to prevent them from getting through.

This fact would not in itself carry us far, but there are other facts which give color to it. In the early months of the war, when it was thought that the United States would take sides against Germany, threats were made in open print that Germans would block the Canals. These threats were taken so seriously that special military guards were put on. A further cause of uneasiness is that Germany conducts a campaign of arson and murder quite regularly in the States, and although it is quite evident—in many cases it has been proved in court—that the cost of the campaign comes from German State funds, an elaborate pretence is kept up that the crimes are committed by irresponsible enthusiasts. The Canal delays, therefore, call for explanation. The obviously fair thing is to let the waiting ships pass through as soon as possible and the unfair thing is to keep them waiting by giving out time-to-time promises.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

BRITISH TRADE AFTER THE WAR

THE White Paper recently issued by the Board of Trade on "British Trade after the War," is a document of the greatest possible interest to the industrial and commercial community. It comprises the report of a Sub-committee of the Advisory Committee to the Board of Trade with respect to measures for securing the position, after the war, of certain branches of British industry. The members of the sub-committee are business men of the highest standing, belonging to various political parties.

It is a significant sign of the times that these gentlemen were able to approach their subject from a purely business point of view, and to agree upon certain recommendations which two years ago would have aroused fierce party conflict. The question of giving Government assistance to various branches of British industry, it is evident, is no longer in dispute. The only question is the way in which it should be given. It is now recognized by men of all parties that it is the bounden duty of the Government to protect British industries from unfair competition, and to advance in every legitimate way the interests of British commerce.

The Protection Feature

Various recommendations are made by the sub-committee as a result of their inquiry. They advise that more money should be devoted to scientific industrial research, that the copyright law should be amended, that transport and banking facilities should be increased, that a Ministry of Commerce should be established, and so forth. All of these, however, are subsidiary to the main recommendation, which reads as follows:—

"We are of opinion that where the national supply of certain manufactured articles, which are of vital importance to the national safety or are essential to other industries, has fallen into the hands of manufacturers and traders outside this country, British manufacturers ready to undertake the manufacture of such articles in this country should be afforded sufficient tariff protection to enable them to maintain such production after the war."

The significance of this recommendation is enhanced by the following remarks in the body of the report: "We are bound to say that, so far as our particular inquiry has gone, though some amount of weight has been attached to the various proposals put forward under the preceding heads, they were regarded as of secondary importance in compari-

son with one question, and that is the possibility or otherwise of tariff protection after the war. Practically all the representative firms and associations consulted by us asked for a measure of protection."

Widely-Spread Import Duties

This question of a tariff, it is obvious, lies at the very root of the problem of how to advance the interests of British industry, for we cannot expect increased production unless it is encouraged by security for enterprise. We cannot protect our manufacturers against the underselling tactics of the German dumper without it. Nor can we give preferential terms of entry into our markets to our overseas kinsmen and our Allies without a tariff. On this point the sub-committee report "that there exists a strong desire to respond to the feeling in our Dominions in favor of an Imperial preference in trade, and that there is also a strong desire to arrange preferential trading with those who are our Allies in the present war."

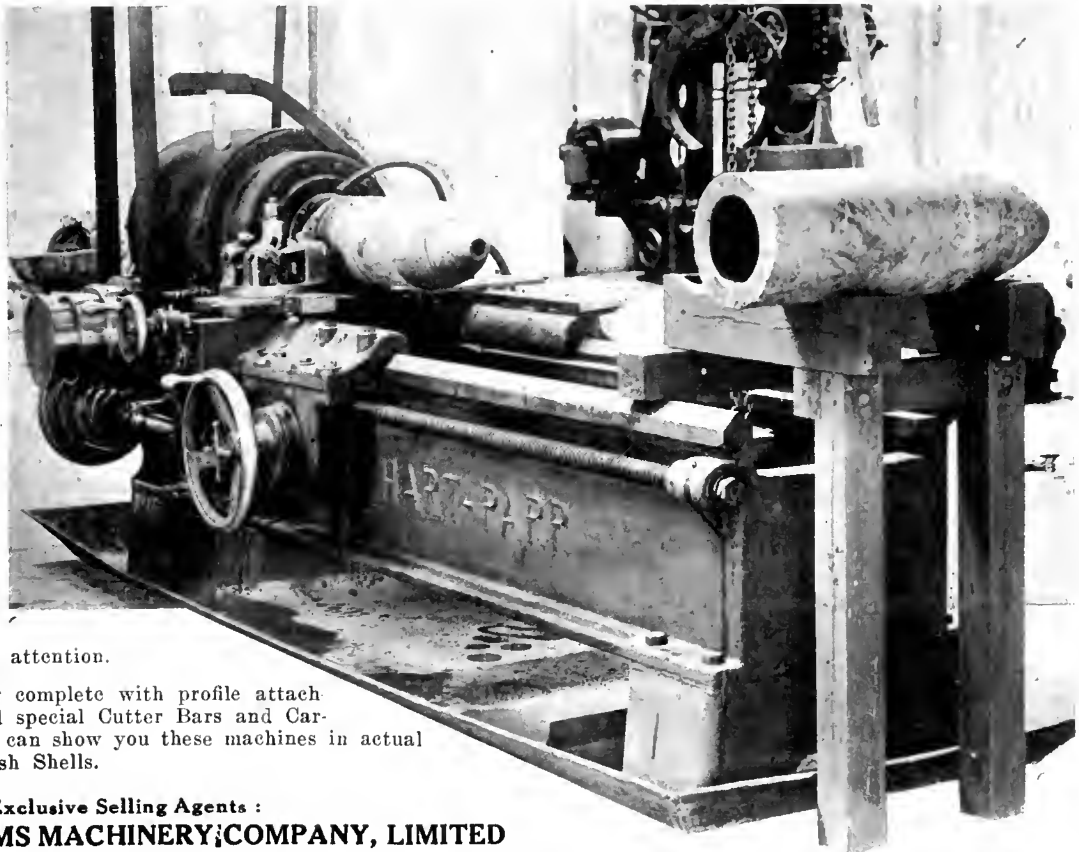
They further state that "cheap and abundant capital for the employment of their labor is of the greatest importance to the working classes." Taking these two considerations together, the sub-committee express their opinion that "it will be necessary to impose some widely-spread import duties, and we are therefore prepared to recommend that a larger proportion of the revenue should be raised by reasonable import duties. We are of opinion that such import duties would go a long way towards satisfying the requests for special protective treatment for the industries which we have had under consideration."

Prompt Action Wanted

Business men, and thoughtful men of all classes, will agree with the Board of Trade Sub-Committee that "widely-spread import duties" provide the only practical means of giving protection to our vital industries and enabling us to arrange mutually preferential tariff terms with our Dominions and our Allies. Not only so, but these duties would produce a large revenue to assist in financing the war. Even those who have hitherto opposed an extension of our tariff because of their adherence to effete economic dogmas are now convinced that, under the new conditions, their objections can no longer be maintained. The pressure of circumstances and the logic of necessity have brought about a change of opinion which no amount of public speaking or writing could have effected. It remains now for the Government to take prompt action upon the lines of the sub-committee's report, and thus demonstrate both to friend and foe what our future fiscal policy will be.

HART-PARR LATHE

for producing SHELLS from 6 in. to 9 in. diam.



This tool possesses enormous stiffness and great durability, and is wonderfully easy to control.

It has the accuracy that's so highly essential in the manufacture of munitions, and requires very little attention.

Fitted up with tooling complete with profile attachments for turning, and special Cutter Bars and Carriages for boring. We can show you these machines in actual operation on 9.2" British Shells.

Exclusive Selling Agents :

The A. R. WILLIAMS MACHINERY COMPANY, LIMITED
TORONTO, CAN.

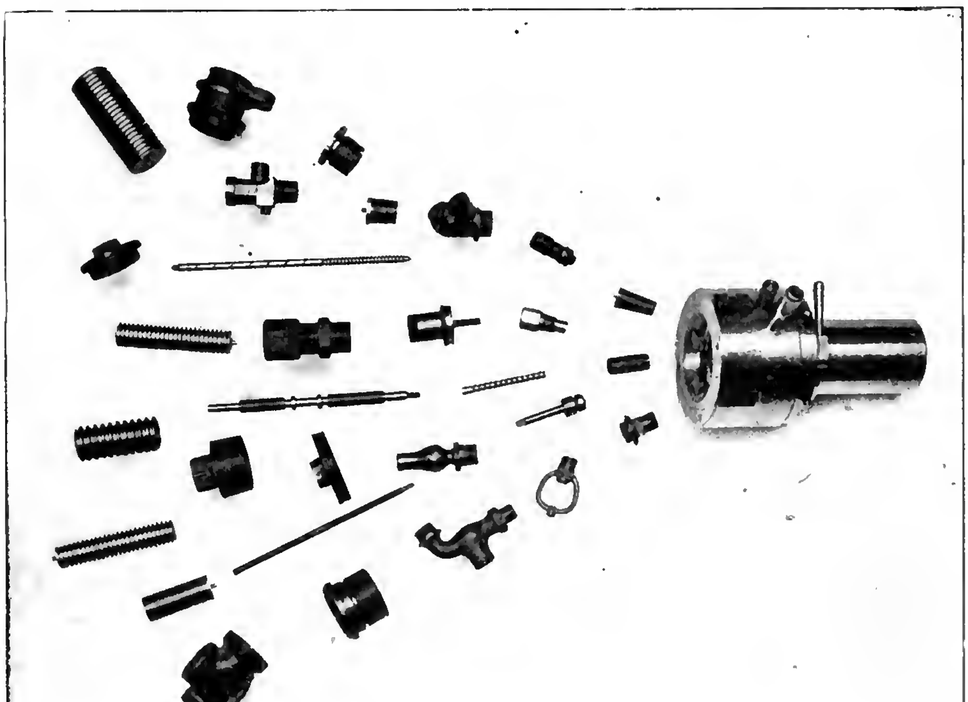
Every Thread a Perfect Thread

GEO MET RIC

THAT'S THE REASON

Are you running a Screw Machine without a Geometric Die Head for your Threading Operations?

Take the subject up with us



The Geometric Tool Company, New Haven, Conn., U.S.A.

Canadian Agents :

Williams & Wilson, Ltd., Montreal. **The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.**

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Mount Brydges, Ont.—The Canadiau Crow-Elkhart Co. may build an addition to their motor car plant.

Medicine Hat, Alta.—The Medicine Hat Pump & Brass Mfg. Co. is in the market for a universal milling machine, as well as considerable other equipment.

Welland, Ont.—J. C. Diffin has been awarded the contract for a two-storey addition to the drum shop of the Union Carbide Co. The additiou will be of fireproof construction, and will cost $20,000.

Montreal, Que.—The asphalt refining plant, which the Imperial Oil Co. propose establishing here, will be located at Point aux Trembles. Work has already started on the foundations for the refinery, which is expected to cost nearly $1,500,000.

Electrical

Cobalt, Ont.—The Northern Ontario Light & Power Co. has decided to instal a power line into Kirkland Lake Camp. The line will be completed by about June 1, it is expected.

Sudbury, Ont.—Some extensions to the street lighting system sanctioned last year, but not installed, will be proceeded with. A number of 600-c.p. bracket lamps will be installed.

Sarnia, Ont.—Engineer J. J. Jeffreys, of the Ontario Hydro-Electric Commission, advises that when Sarnia instals a street lighting system a good set should be put up. The system suggested by Mr. Jeffreys would cost $12,000 a year, in place of the present $7,000 a year.

General Industrial

London, Ont.—The Middlesex Mills Co. contemplate building a factory here.

St. Jerome, Que.—The St. Jerome Mfg. Co. will build an addition to their factory here.

Sarnia, Ont.—It is reported that a syndicate will establish a flax mill here in the near future.

Quebec, Que.—Fire recently destroyed G. A. Vandry's factory. The loss is estimated at $42,000, which is covered by insurance.

Sarnia, Ont.—The Dominion Salt Co. is building an addition to the factory here, which is expected will increase the production of salt by about 250, to 300 barrels per day. The cost is estimated at $15,000. The company will start operations on drilling another well shortly.

Fort William, Ont.—The Ogilvie Milling Co. will build another mill here to cost $150,000. Barnet & McQueen are the contractors.

Municipal

Lethbridge, Alta.—The City Commissioners have decided to purchase a motor-driven fire pump ,which will cost about $4,000.

Burlington, Ont.—The Town Council are considering the question of purchasing a motor hose truck for the fire department. A by-law will be submitted to the ratepayers.

Montreal, Que.—Plans for the construction of a tunnel under the Lachine Canal at the Wellington Bridge have been submitted to the Board of Control. Estimated cost, $1,200,000.

Kingston, Ont.—It is understood that the Seymour Power Co. will accede to the request of the Kingston Utilities Commission and withdraw from the proposed agreement for power supply because of the clause that the local power plant must be used only during an interruption in the service. The Utilities

EQUIPMENT FOR AUSTRALIAN NAVAL DOCKYARD

Tender forms and specifications have been forwarded by D. H. Ross, Trade Commissioner, Melbourne, for 43 machines of various types required for the equipment of the Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W. Tenders will be received, subject to the conditions specified, up to May 1, 1916, addressed to the Director of Navy Contracts, Melbourne, Australia. The last mail in time to reach Melbourne on May 1 is that leaving San Francisco on March 22 and due at Melbourne on April 12. The tender forms are open to the inspection of Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer file No. A-1435). Particulars of the requirements are briefly outlined thus:

Three 50-ton overhead travelling cranes.

One 25-ton overhead travelling crane.

Two 5-ton overhead travelling cranes.

One 10-ton revolving cantilever crane.

Two 5-ton travelling portal jib cranes.

Two 7½-ton jib cranes.

One 5-ton jib crane.

Two 15-ton hydraulic cranes.

One 6-ton hydraulic crane.

One 6-ton wall crane (hydraulic).

Two 3-ton wall cranes (hydraulic).

Two electric passenger elevators.

Two electric goods elevators.

One 2½-ton gauge locomotive with crane attached.

One 2½-ton gauge locomotive without crane attached.

Three electrically-driven air compressors, 1,500 cu. ft.

One 15-ton hydraulic winch.

One 5-ton hydraulic winch.

Nine 10-ton hydraulic capstans.

Two 5-ton hydraulic capstans.

One bar shearing machine.

One double-ended horizontal punching machine.

One 10-ton overhead travelling crane for shipyard fitting shop.

Good Business Advice: "Meter Your Time"

Time costs you money. You buy it just as you buy a raw material. Why not check its delivery, its use, and the profits on its re-sale with the same accuracy that you check these factors in the working up of a raw material.

Checking time is even more important because time lost can never be regained.

Time losses can be prevented, however, by accurately metering all of your Time factors.

International Time Recorders are Time Meters

They give you an accurate check on all the phases of your Time investment.

They aid discipline, promote co-operation and prevent disputes.

Made in 260 styles.

There is an International that will meet your requirements. A post card will bring more complete details.

The International Time Recording Company of Canada, Limited

Toronto:
Cor. Yonge and Shuter Streets
Toronto Phone: Main 2460

F. E. MUTTON
General Manager

Montreal:
W. A. WOOD, Jr., Sales Agent
Cartier Building, Cor. McGill and Notre Dame Streets. Phone M7025

Don't Keep It--Sell It!

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor
or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

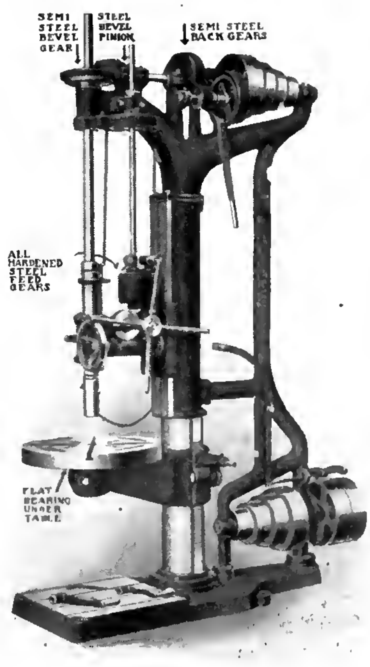
Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

—wide range

The range of work that can be handled on this machine is surprising.

But that is not all—the construction ensures **strength, accuracy** and **speed** seldom found in a machine tool of this kind.



AURORA Drilling Machines

These machines are splendidly adapted to the production of high explosive shells.

The work done by them is always at the highest stage of perfection—and the labor cost is comparatively low. Write for full details.

Stationary head—Sizes 20"-21".

Sliding Head—Sizes 22"-44".

The Aurora Too Works
AURORA IND.

Commission demanded that it have the right to operate the plant at any time.

Windsor, Ont.—By a vote of 342 to 290 the by-law to give tax exemption to the Maxwell Motor Co., of Detroit, Mich., in exchange for the erection of a $65,000 factory in the municipally-owned industrial district, was carried last Saturday.

Windsor, Ont.—A by-law, carried on March 4 to authorizze an expenditure of $15,000 on a tractor for the aerial fire truck, a service truck and another motor-drawn waggon. All the horse-drawn apparatus used by the Fire Department will be discarded.

Sarnia, Ont.—Three engineers, F. W. Thorold, of Toronto; W. S. Lee, of Montreal, and Engineer Dallyn, of the Ontario Board of Health, will examine the waterworks system and report to the City Council as to the possibility of improving defects in the supply.

Port Moody, B.C.—The City Council have passed a by-law authorizing an initial expenditure of $40,000 on waterworks extensions. The work will include the construction of a pipe from Noon Creek, the contract having been let to the Robertson-Godson Co., of Vancouver. The construction of a storage reservoir will not be proceeded with at present. This part of the work will cost about $40,000.

Tenders

London, Ont.—Tenders are being received until March 13 for iron castings, rubber supplies, hardware, road oil, manholes, catch-basins, etc. Specifications may be obtained from H. A. Brazier, city engineer.

Toronto, Ont.—Tenders will be received by the chairman, Board of Control, City Hall, up to Tuesday, March 14, 1916, for the supply and delivery of: One single-truck, double-end street car, completely equipped; one car body, double-end, single-truck; equipment for one single-truck; equipment for one single-truck car. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Ottawa, Ont.—Tenders will be received until Monday, March 13, 1916, for the construction of timber lock gates and their equipment for the East River Lock, near New Glasgow, Pictou County, N.S. Plans and forms of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the district engineers at Antigonish, N.S.; Halifax, N.S.; Shaughnessy Building, Montreal, P.Q.; Confederation Life Building, Toronto, and on application to the postmaster at New Glasgow, Nova Scotia.

Toronto, Ont.—Tenders will be received by the chairman, Board of Control, City Hall, up to Tuesday, March 14, 1916, for the supply and delivery of: Special track work, for St. Clair Avenue barn; extension, Toronto Civic Railway. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Drummondville, Que.—Tenders will be received until March 15, 1916, for the supply of materials and the construction of a pumping station and mechanical gravity filters. Those interested can obtain specifications and plans covering said works at the office of the town clerk, W. A. Moisan, and also at the office of M. M. Ouimet & Lesage, 76 St. Gabriel Street, Montreal, P.Q.

Personal

George Gilbert Sheldon Williams, editor and proprietor of the B. C. Mining Exchange and Engineering News, died at Victoria, B.C., on February 13, aged 49.

C .D. Garner has succeeded J. A. Day as manager of the Cleveland Pneumatic Tool Co., of Canada, Ltd., Toronto. Mr. Garner was formerly assistant manager of the company.

Frank G. Wallace, of Pittsburgh, Pa., for many years a director of the Canadian Locomotive Co., Kingston, Ont., has accepted the position of managing director of the company.

Col. David Carnegie, expert ordnance adviser to the Minister of Militia and a member of the Imperial Munitions Board, has returned to Ottawa after two months' absence in England.

Thomas Tomlinson, head of the firm of Thomas Tomlinson & Son, iron founders, Frederick Street, Toronto, died on Feb. 22 in the Western Hospital, following an accident. The deceased was 45 years of age.

E. P. Plewes, of the E. P. Plewes Co., Winnipeg, has returned from an eight weeks' trip down East, where he was buying tools, etc., for shipment to Great Britain. On his return he called at Chicago and other American points.

J. E. MacArthur has been appointed to fill the position of superintendent of the No. 1 plant of the Russell Motor Car Co., Toronto. Mr. MacArthur was formerly superintendent of the Robinson Fire Apparatus Mfg. Co., of St. Louis, Mo., and also was with the Pierce-Arrow Co., of Buffalo, and the Brown & Sharpe Co., of Providence, R.I., for some time. He has had wide experience in the manufacture of small interchangeable parts.

E. E. Forgeus has been appointed purchasing agent of the Eastern Car Co., New Glasgow, N.S.

Dr. T. H. Crottey, Winnipeg, has been appointed Western secretary of the Canadian Manufacturers' Association, succeeding Chas. P. Webster, now Industrial Commissioner at Winnipeg.

D. H. McDougall, superintendent of the iron ore mining operations of the Dominion Steel Corporation, Sidney, N.S., has been appointed to the position of general manager of the company. Mr. McDougall, who is a Nova Scotian, is 36 years of age, and has been associated with the Corporation for a number of years.

Trade Gossip

The John Inglis Co., Toronto, have been awarded a contract for a boiler and pump by the City Council of Cornwall, Ont., at a cost of $2,800.

The International Acheson Graphite Co., Ltd., Niagara Falls, N.Y., has changed its name, and hereafter will be known as Acheson Graphite Co.

Wallaceburg, Ont.—The Board of Trade has elected the following officers: John Zavitz, president; H. A. Stonehouse, vice-president; Ray Martin, secretary.

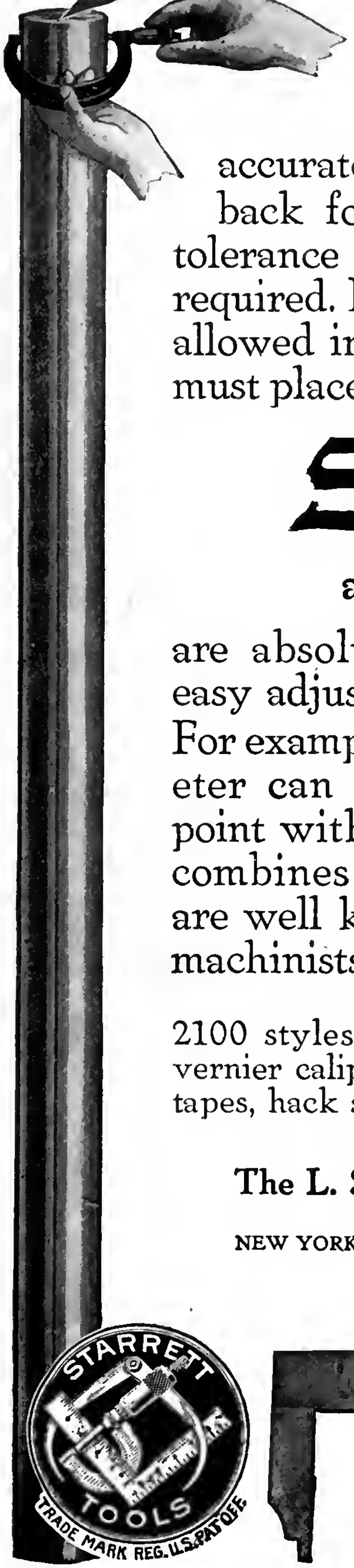
Goderich, Ont.—The Board of Trade has elected the following officers for the ensuing year: President, M. G. Cameron; vice-president, C. L. Moore; secretary, G. L. Parsons ;treasurer, Wm. Campbell.

The Wabi Iron Works, New Liskeard, Ont., have been appointed sole manufacturers for Canada for a machine for treating sand and slime in connection with mining operations.

The Canadian Brakeshoe Co., Sherbrooke, Que., is operating four 2½-ton basic-lined 3-phase electric furnaces. The furnaces run continuously and turn out four heats each every 24 hours.

The Electric Steel & Metals Co., Welland, Ont.—The following directors have been appointed for the year:—E. Carnegie, president; W. L. Renton, vice-president; Sir Charles Ross, Col. R. W. Leonard, and William Carnegie.

The Consolidated Engineering Co., Chicago, Ill., have purchased the complete plant of the Massachusetts Fan Co., Watertown, Mass. John E. Anderson, late with the B. F. Sturtevant Co., Boston, Mass., will be in charge of the heating and ventilating department



THE best machinist is the one who can caliper his fits so accurately the jobs never come back for refitting. The limits of tolerance are so small that the greatest accuracy is required. In forced fits 1-1000 of an inch is the limit allowed in many cases. This means the machinist must place great dependence upon his instruments.

Starrett Tools

and Instruments of Precision

are absolutely true and are designed for quick easy adjustment.

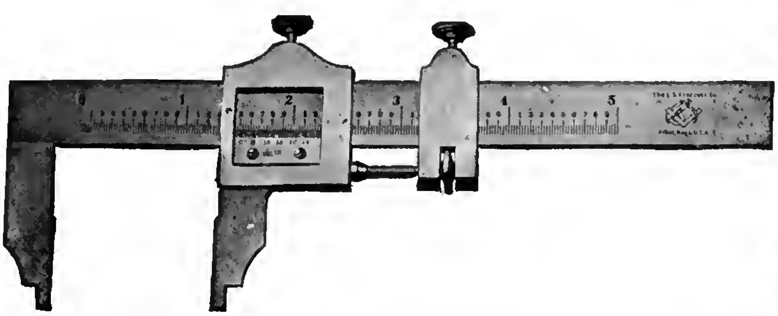
For example—the Starrett quick adjusting micrometer can be instantly opened or closed to any point within its capacity. This saves time and combines speed with accuracy. Starrett Tools are well known as standard by all expert machinists and engineers.

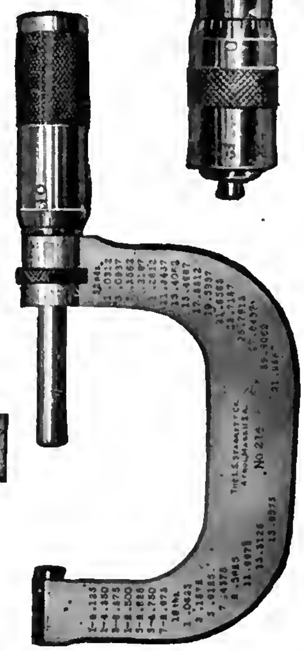
2100 styles and sizes—including micrometers, vernier calipers, dividers, combination squares, steel tapes, hack saws. Write for free catalog No. 20-3.

The L. S. STARRETT CO., Athol, Mass.

"The World's Greatest Tool Makers"

NEW YORK LONDON CHICAGO





STARRETT TOOLS TRADE MARK REG. U.S. PAT. OFF.

If any advertisement interests you, tear it out now and place with letters to be answered.

The Gurney Scale Co., Hamilton, recently shipped a 6-ton dump scale to Spirit River, which is located well up in the Peace River country. This is the furthest north point in Canada that a dump scale has ever been shipped or operated.

Controlled Munitions Plants in Britain.—A total of 2,834 establishments for the manufacture of shells and munitions are now under control of the British Minister of Munitions. The first factory was taken over by the Imperial Government on July 12, 1915.

Soldiers Honored.—On February 26 the H. W. Petrie Machinery Co., Toronto, bade farewell to four more of their employees who are leaving for the front, and presented them with soldiers' wrist watches. The four are: E. I. Ronan, S. D. Bremner, H. R. Beer, and J. C. Scanlon. Twelve from the firm have now gone.

Toronto, Ont.—Definite action is likely to be taken in the near future for inaugurating a big publicity campaign with the object of making widely known the great advantages of Toronto as a tourist resort and its magnificent opportunities as a field for new industries. A committee has been appointed to prepare a plan of campaign of publicity, with President Arthur Hewitt, of the Board of Trade, as chairman.

Ottawa, Ont.—A deputation from the Trent Valley recently visited Ottawa to request that Eastern Ontario be given the opportunity now enjoyed by Western Ontario in the matter of power from the Hydro Commission for the farm, factory and transportation. The obstacle lies in the disputed jurisdiction between Provincial and Federal Governments. The source of power is mainly on the Trent Valley Canal.

Flax Industry Development.—The Department of Agriculture, Ottawa, is studying the needs and possibilities of the flax growing industry in Canada. Prof. Grisdale, director of the Central Experimental Farm at Ottawa, has recommended that a flax division of the Department of Agriculture be established for the purpose of carrying on experiments as to the best methods of cultivation and handling the flax, and the varieties best suited to the soil and climate of Canada. Prof. Grisdale also suggested that a small but complete plant be erected at the Experimental Farm to separate the fibre from the flax straw.

Canada's Gold Output.—Preliminary estimates of the gold production in Canada in 1915 give a total of 962,664 ounces, an increase of 189,486 ounces, or about 25 per cent. over 1914. In dollars,

the value of the output was about $19,-300,000, against $15,500,000. The high record was 1,350,475 ounces in 1900. It is evident from the report of the Ontario Bureau of Mines that the Porcupine and Kirkland Lake districts have been responsible for a greater part of the increase. Final figures for Ontario show a total of 411,588 ounces, worth $8,501,391, produced in 1915, against 269,942 ounces, worth $5,529,767, the previous year. The increase of 141,646 ounces for Ontario for the year compares with a total estimated increase of 189,486 for all Canada.

Book Reviews

"Advanced Machine Work" is the title of a new text book, by Robert H. Smith, a well-known director of shop work at the Massachusetts Institute of Technology. The book treats of the many important phases of shop practice, and has already been adopted in a number of schools and colleges. Among the subjects treated are engine lathe work, cutting tools, turning, fitting, threading, chucking, reaming, broaching, drilling jigs, boring bars and machines, grinding, planing, milling, tool making, and gearing. The price of the book is $3, and there is a special discount to teachers and instructors.

Catalogues

Cold Storage Doors.—The Jamison Cold Storage Door Co., Inc., Hagerstown, Md., have issued a bulletin dealing with the "Jones" and "Noequal" doors for cold storage installations. The principal constructional features of these doors are described and illustrations show the general design.

Nonpareil Corkboard Insulation, is the title of a catalogue being issued by the Armstrong Cork & Insulation Co., Ltd., Montreal, Que. The catalogue deals with the production and application of cork for insulating purposes and contains a great deal of interesting information of both a practical and scientific value. A number of pages deal with the heat conductivity of "Nonpareil" corkboard and other insulating materials and also includes reports on tests of these materials. The fire-resisting properties of "Nonpareil" corkboard are described, accompanied by illustrations, showing fire tests and a number of installations of this material. Several specifications for erection covering various types of building are included with sectional diagrams showing the corkboard construction. The concluding pages deal with miscellaneous uses for "Nonpareil" corkboard, illustrated. This is a high class catalogue containing a considerable amount of useful information for refrigeration engineers. The press work is good and the illustrations are very clear. Copies will be sent to interested readers on application.

Centrifugal Pumps for all purposes, including condenser circulation, irrigation, drainage, dry docks, and general mill and power plant service, for motor, engine or belt drive, are now being built by the Wheeler Condenser & Engineering Co., of Carteret, N.J., and are described in their new bulletin 108—A. These pumps are of the single-stage, double-suction, split-casing type, for heads from 0 to 300 feet. Particular stress is laid in this bulletin to the adequate testing facilities in the Wheeler hydraulic laboratory, provided with calibrated motors, gauges and tanks with V-notch and rectangular weirs for measuring the quantity of water, and secondly, to the accurate casting and machining of pump parts, particularly the impellers. A short description of foundry methods is given. Among the designs of pumps shown, several are of particular interest, such as, a combined motor and geared turbine-driven centrifugal pump, a typical complete surface condenser auxiliary, with geared circulating pump direct connected to turbo air and condensate pump driven from a common turbine, a large vertical shaft dry dock pump, etc. Several pages are devoted to vertical shaft pumps, and excellent illustrations show the design of the vertical thrust bearing with self-contained lubricating oil pump, of the lower self-lubricating guide bearing, and the design of impeller and casing.

Classified Advertising Section

Classified Advertisements

Rates (payable in advance):—2c per word first insertion, 1c per word subsequent insertion. 5c additional each insertion when Box Number is required. Each figure counts as one word.

FOR SALE

18 IN. x 10 FT. BRADFORD LATHE AND countershaft, also 18 in. x 8 ft. Lodge & Shipley, both in splendid condition; immediate delivery. Box 172, Canadian Machinery. (8)

FOR SALE—CINCINNATI ENGINE LATHE, 18" x 6'; taper attachment, hollow spindle, quick-change gears, compound rest, two chucks; also 12 H. P. gas or gasoline engine. Apply Wheeler Needle Works, Paris, Ont. (7)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London Ont.

MACHINE SHOP WITH MACHINERY, garage and house, on nine thousand four hundred feet land, with adjacent vacant twenty-eight thousand feet; next railway station; good site; good accommodations; twenty miles from Montreal; immediate possession; bonna expectation to big concern. Box 173, Canadian Machinery. (6)

TURRET LATHES FOR SALE—3—2 x 24 Jones & Lamson Turret Lathes, $500.00 to $600.00 each. 3—19" swing Jones & Lamson Turret Lathes, fitted with Diamond Turret. The above machines are in good condition, also 2 Small Turret Machines, 1¼" hole in the Turret Head. Apply to A. B. C., Box 171, Canadian Machinery. (6)

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double handsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

FOR SALE—50 GOOD MACHINES. BOLT Cutters, Headers, Pointers, Tappers, Automatic Shavers and Slotters, Presses, Drill Press, Slitters, Small Shears, Plain Bench Lathes, Pulleys, etc. Bargain prices. Immediate shipment. Send for descriptive list and prices. Shelton Company, Shelton, Conn., U.S.A. (9)

FOR SALE, AT A SACRIFICE—SAW MILL outfit, A1 condition; 50 H.P. stationary boiler, 45 H.P. "Leonard" engine. "Green" carriage, Simonds saw, edger, planer, lathmill, etc. Easy terms. Write quick. R. Parker & Sons, Uno Park, Ont. (12)

FOR SALE—2-PHASE INDUCTION MOTORS, 1 only WESTINGHOUSE, Type C, 50 H.P.; 1 only WESTINGHOUSE, Type CCL, 50 H.P.; 1 only CANADIAN GENERAL, type 10, 20 H.P. In excellent condition. Prices attractive. Full particulars on application. Cummer-Dowswell, Limited, Hamilton, Ont.

FOR SALE—PLANING MILL AND FACTORY, doing good business. Terms $2,000.00 cash. Balance to suit buyer. Address O. Ribble, Bronte, Ont. (13)

AUTOMOBILE BUSINESS AND NEW Garage for sale. Overland agency; lots of repairing; also Overland roadster, new tires, $300.00; 10 light D.C. generator, $25.00; K.W. magneto (new), $15.00. W. E. Hawes, Otterville, Ont. (13)

SITUATIONS VACANT

JUNIOR DRAFTSMAN, EXPERIENCE ON structural work an advantage: permanent position to right man; give fullest possible particulars. Box 174, Canadian Machinery. (7)

WANTED — MACHINISTS AND FLOOR hands on heavy and miscellaneous medium work; steady employment, modern shop, good wages. Apply, stating age and experience, P.O. Box 6, Walkerville, Ontario. (6)

SITUATIONS WANTED

MECHANICAL SUPERINTENDENT, EFFICIENCY engineer and master mechanic having twenty years' experience in all lines of general machine, blacksmith, carpenter and pattern shop practice, foundry work, power plant, refrigerating and electrical engineering, is open for engagement. Box 177, Canadian Machinery. (11)

WANTED—ASSISTANT FOREMAN FOR machine shop, working on shells; must be a thorough mechanic with previous experience on the larger sized shells and able to take full control of shop employing up to a hundred men. Apply giving full particulars as to experience, with whom previously employed, age, and salary expected, and enclose copies of references. Only those giving full particulars in the first instance will receive consideration. Liberal remuneration to the right man. Apply in confidence to Box 165, Canadian Machinery. (6)

WANTED

WANTED — ONE TURRET LATHE WITH wire feed, and power feed to turret to take round bars up to 1". J. H. Connor & Son, Ltd., Ottawa, Ont.

AGENTS WANTED

BRITISH HOUSE MAKING SYRINGES AND spraying machines for every possible use, need Canadian agents. The line is the most complete in the world and includes knapsack and ordinary spraying machines for fruit growers, limewashing machines for farms, factories, etc. Disinfecting machines for all purposes. Anything in the way of spraying and washing machines made to suit the market. Agents must be aggressive and ready to work the line thoroughly. Write: Spraying Machines, c/o Canadian Machinery, 143 University Avenue, Toronto.

MANUFACTURERS' AGENTS—IMPORTANT Sheffield (England) firm actually manufacturing high speed steel, twist drills, milling cutters, etc., carbon steel, mining drill steel, shear blades, etc., requires a live firm to act as representatives for this part of Canada, at end of war. Write stating experience of above lines, agency conditions, mode of handling the agency, etc., in confidence, to Box 811, Dorland Agency, Ltd., 16 Regent St., London, S.W., England. (8)

FOR SALE

Two 96-horse-power Gas Engines.

Complete with producers.

Made by the largest English manufacturers.

WILL SELL CHEAP

Empire Mfg. Co., Ltd.
London, Ontario.

POSITION WANTED

Electric-Hydraulic-Steam Engineer

of high calibre is open for position. Experience in Great Britain and America.

Box 178,
Canadian Machinery.

AGENCY WANTED

A firm in England is desirous of securing the sole agency for Great Britain for twist drills, taps, stocks, dies, reamers, milling cutters, etc. Please communicate full particulars to

Box 175
Canadian Machinery

To precede pp. 233

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, MARCH 16, 1916 No. 11

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President H. T. HUNTER, Vice-president

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

The Technical Journal a Factor in Personal Advancement

By J. H. R.

To the young man starting life or to the man of mature years directing the efforts of numerous subordinates, the trade journal of repute is of incalculable benefit in bringing to attention new developments, keeping abreast of current practice, and preparing for future efforts in a particular line. As a means of moulding the youthful mind, the trade journal is daily becoming more universally recognized and highly valued, in all branches of industry.

ONE of the most pressing problems confronting our young men to-day, and which they must give heed to and solve, affecting materially, as it does, their future prospects, is that of the choice of a trade or profession. Many young men at present employed in our metal working industries have been deprived of the elementary theory pertaining to their daily labor, and their struggle for advancement is, therefore, made proportionately difficult.

Those who have had the privileged opportunity of continuing their studies from the public school to the high school, and thence to a technical college or university, form a very small percentage of the human element that strives day in and day out to keep the innumerable wheels of industrial activity constantly in motion. The great majority after a public school course find their conditions such that it is almost imperative for them to seek employment, and assist in the maintenance of themselves or their families.

Initial Ventures Usually Unsatisfactory

Under these circumstances, very few find their first remunerative position suited to their taste or inclinations, yet the compensation is invariably sufficient to meet their immediate needs. However, the possibilities are that in a short time the young man will either, from lack of interest or want of efficiency, relinquish his position, with the expectation of improving conditions in some other direction. Thus it is that the average youth is liable to wander from one job to another, giving little thought for the most part to the choice of a permanent vocation. Many men to-day are hanging their clothes up on the wrong hook—in other words, they are not qualified for the work at which they are employed. They are in their present position largely by accident or chance. Once in a while accident or chance have been the means of placing a man in his proper niche, but more often he will be found making what a mechanic might term "a very poor fit." However, by individual initiative and persistent effort to acquire all possible shop knowledge, many men will by constantly applying themselves to the practical side of their work be able to master the whole raft of intricate details connected therewith, but which to those less energetic would be almost impossible.

Generally, the man who can adapt himself most readily to existing conditions, devising ways and means to lighten his manual efforts has had a varied experience, acquired from working in different plants, where the class of product and equipment require a diversity of operative methods.

Acquiring Technical Knowledge

In the absence of opportunity to acquire engineering knowledge from practical experience no better method is available than through the pages of the technical or trade papers. This class of educational medium which is constantly being developed contains the result of long years of study and experience in the shop, laboratory and class-room. Few engineering feats of to-day—however insignificant—pass unrecorded. Even the smallest details are duly featured.

Information to be found in trade or technical books is neither acquired, nor even desired, generally speaking, by the average artisan, whose duty it is to perform certain work previously planned and arranged by those who have studied the fundamental principles of theoretical and practical engineering. The man, however, be he old or young, who finds employment at a trade requiring a certain amount of technical knowledge, and who is making no effort to become better acquainted with the theoretical side of that trade, is failing both in his duty to himself and in his obligation to those whom he is called upon to serve.

A workman's chief asset is his ability to adapt himself to existing conditions, applying all his knowledge and skill to the successful carrying out of the duties that are daily placed before him. However, the large majority of industrial workers find their store of knowledge limited to the conditions prevailing in probably one or at most a few particular shops. To these, more than any others, perhaps, the study of up-to-date methods and devices through the agency of books or periodicals is here suggested.

Text Books and Trade Papers

Obtaining the necessary technical information with the minimum expenditure of time and money is one of the problems that confront the workman, who, in many cases, finds it difficult, if not impossible, to attend a technical school, or supply himself with the necessary books containing the data pertaining to his particular calling. True, the shelves of most libraries contain a multitude of text-books on every subject, but for the average mechanic many of these books would be entirely beyond his limited understanding.

However, it is almost necessary—in fact, essential, that the young man entering a workshop to learn a trade should become conversant with the fundamental principles which underlie his manual efforts. For this reason it is advisable to secure a few suitable books on the elementary principles of mechanics, as these are subject to little or no change. Shop practice, on the other hand—due to the development of modern methods—is changing so rapidly that a large percentage of scientific publications may in a short time become obsolete.

To be conversant with the best practice pertaining to a certain branch of a trade is one of the chief elements in proficiency. It has often been said that "the technical and trade papers of to-day become the text-books of to-morrow." By the systematic study of good reliable technical and trade papers, no one can avoid being impressed by the wide range of valuable information contained within their pages, both from a theoretical and practical viewpoint; but unless such publications are deemed to be part of one's business, it is doubtful if the desired end will be attained. The leisure hours of the average young men of to-day are so well filled with pleasure-seeking that little thought or time is given to the improvement of the mental faculties. The question of keeping posted in the latest developments of one's business should be equally important with the drawing of one's pay at the close of the week.

The Exceptional Employee

While the average man is content to plod along, doing just what he is told to do and no more—the exceptional man, the man who is always on the look out to improve his position, will be found, not only accomplishing his allotted task with sustained effort, but will also be ready and able to offer suggestions for improving or changing existing plant equipment, for the purpose of facilitating and supplementing output.

It is the exceptional employee that

loses no opportunity of studying the methods of the other fellow, and applies them to his own work, if by so doing he can eliminate unnecessary detail, reduce the time of operation, etc. It is to the exceptional employee that other workmen will come for information; pointers on screw-cutting, gear-cutting, spiral milling and a hundred-and-one other questions; and it is this same employee to whom the boss will come to discuss the advisability of certain changes in production or equipment.

It is the exceptional employee who keeps constantly posted on the trend of the trade. By careful study of the trade papers he is always familiar with any changes in machine shop methods, development of new devices, or changes in equipment, which, with modification, can often be successfully applied to local shop conditions.

Every young man should be alive to the rapidly developing changes throughout the industrial field. The possibilities of a man's latent abilities can never be fully realized until he comes face to face with new problems; questions that require more than ordinary thought; difficult situations that necessitate careful consideration. It is true that the more we learn, the less we think we know. To the man who is performing routine work in a factory, one of the best methods of developing his latent faculties is by the study of other men's ideas, through the agency of the trade paper, pertaining to his particular trade or calling.

Recognizing Ability

Does the employer recognize the fact that a man will be of greater service to himself and also to the firm from the study of suitable trade papers?

Heretofore, many engineers and employers have been averse to accepting the opinion of any of their workmen; very often on the ground that by so doing they were admitting their inability to successfully administer their responsibilities. However, it is gratifying to note that those in authority are now more fully appreciating the value of the subordinate, who is not only making the effort to increase his own store of knowledge, but is willing to use same to the advantage of the firm with whom he is employed.

The progressive superintendent will speedily recognize that it is only by mutual co-operation between himself and his foremen and between the foremen and their men that the best work can be accomplished and complete harmony prevail.

No man has yet acquired sufficient knowledge that he can claim a monopoly of any trade or profession. The field of engineering is so large that it is impossible for anyone to assume that they "know it all." The competent foreman will not "call" a man for arguing or discussing a shop problem, but, on the other hand, will encourage his spirit of individuality. The man who has no original ideas of his own cannot be expected to fit in with the policy of any enterprising and progressive establishment.

Even the so-called "fool" suggestions are not so numerous that they should try the patience of the foreman. No two persons have been endowed with the same capabilities, and, although the thought of the operator may not agree with the ideas of his superior, the very suggestion shows that the mind of the former is alert to the possibilities of his physical and mental effort. Many a promising career has been retarded by the "chief" ridiculing some well-meant offering of one of his employees. Some foremen go so far as to ignore the offered suggestion, and yet propound the same idea to the superintendent as one of their own. However, it is interesting to note that this (dog-in-the-manger) type of foreman is gradually being eliminated, and a spirit of all-round co-operation being displayed instead.

Expressing Mental Development

What men require to-day is encouragement towards and appreciation of their mental development. The awakening of a young man's dormant intellect enlarges his vision and broadens his mind. His view of the future gradually changes, and in place of uncertainty and lack of determination, there comes to him the mental conception of untold possibilities and opportunities. However, it is necessary that impressions on the mind should also find expression through the tongue or the hand, otherwise the constant accumulation of knowledge will make the mind a storehouse instead of a transmission station. What advantage is it in knowing how to do a thing if we never have to do it? How many of us have benefited by seeing an interesting "kink," an unusual method, a certain device illustrated and described in the pages of a trade paper, which has enabled the elimination of many an irksome duty and effort? It is through the agency of the trade paper that many developments and improvements in the industrial world receive their first publicity.

LABOR BRANCH, ONTARIO PUBLIC WORKS DEPARTMENT

THE labor branch of the Public Works Department, Province of Ontario, which will be established, is to be constructed on the lines suggested by the committee on unemployment in their report, according to the Hon. Finlay G. Macdiarmid, Minister of Public Works. Mr. Macdiarmid intends appointing a superintendent to preside over the branch, and it is understood that he has the man in mind. The salary will not be less than $2,500. Mr. Macdiarmid introduced his bill last week. The principal work of the department will be to:

Duties Outlined

Collect such statistical and other information respecting trades and industries in Ontario as may be deemed necessary or expedient from time to time.

Ascertain the localities in which mechanics, artisans, or workmen in any particular trade or industry are required, and, where practical, assist in supplying the demand for such work or labor.

Ascertain and report upon sanitary and other conditions relating to the health, comfort, and well-being of the industrial classes.

Establish, and maintain in the various centres of population throughout Ontario, employment bureaus and similar agencies for obtaining suitable employment for working men.

Ascertain and report upon the rates of wages paid to employees in the various trades and industries carried on in Ontario.

Inquire and report as to the establishment of new industries in Ontario, particularly in cases where, by reason of the production of raw material for such industry in Ontario, or the immigration of persons skilled in the particular industry or other circumstances, it appears that such industry can profitably be carried on.

Report on Laws

Inquire into, consider, and report upon the operation of laws in force in other parts of the Empire and in foreign countries having for their objects the protection, technical training, and welfare of the industrial clases, and make such recommendations and suggestions thereon as may be deemed advisable.

Consider and report upon any petition for, or suggestion of a change in the laws of Ontario relating to labor and wages, or any matter affecting the industrial classes presented or made by any Trades and Labor Council or other organization representing those classes, or by any other person.

Prepare and transmit to the Lieut.-Governor-in-Council annually a report containing the reports of the officers employed in the administration of the various Acts assigned to the branch, and upon the work of the branch during the preceding year, together with such statistical and other information as may have been collected in the branch.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

PAPER CUTTING KNIVES

By D. A. Hampson

A RECENT excellent article in "Canadian Machinery," dealt with the sharpening of paper cutting knives, and as the subject is of such widespread interest it is worth further light. Every little hamlet in these days has its printing office, if not its newspaper, and in each of these the paper cutter is an essential factor. It

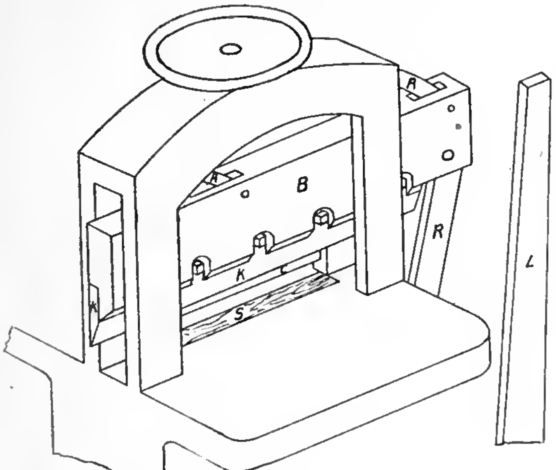


FIG. 1.

has been estimated that there is one paper cutter for every 1,500 inhabitants and where binding and a considerable amount of publishing is done, the proportion is greater. To do good work, each cutter must have a blade or knife of almost razor sharpness, thus it will be seen that the sharpening of these knives must ever be a live subject to mechanics engaged in the repair business.

Working Principles

Paper cutters may be hand or power operated; the cutting principles being, however, the same in both cases. An idea of the mechanism of the machine may be obtained by referring to the sketch Fig. 1. A heavy casting or knife

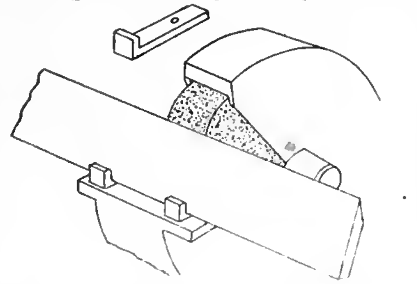


FIG. 2.

bar B, to which is bolted the knife, swings on the links AA, and is moved up and down by means of the lever L, actuating (through a shaft not shown), the link R. The stack of paper is clamped in place by means of the bar C, which is operated by means of the large hand wheel. A piece of hard maple S, is inserted in the table as shown immediately beneath the cutting-edge of the knife. This insures protection to the sharp edge, since the knife on the completion of the cut enters the wood instead of coming down on the iron table.

Grinding the Knives

Keeping the knife sharp is the secret of success in paper cutting, it means a larger output of better work, with less fatigue to the operator, and in order to keep the knives in the best condition practically all machine shops are called upon at some time or the other to sharpen them. In a great many instances, however, such work has been turned down as being of a too special or particular a nature for the equipment on hand. This is in reality an illogical idea, for such a job can be made to pay even better than the average run of small jobs. A 36-inch knife costs about $1 to have it ground, yet this work can be done on a regular tool grinder, which is found in even the smallest shops in a very short space of time, providing there are no big nicks in the knife. The necessary equipment required for this work is shown by Fig. 2, and consists of two angle pieces which are clamped to the flange in place of the usual tool rest. The knife is moved back and forth by hand; the position of the angle pieces giving the desired level.

The writer's experience has been that grinding knives "wet" is by far the best—best for the cutting wheel because it is kept clean and best for the pocket-book because the same work is accomplished in half the time. Experience in grinding on a tool grinder as described above was proved years ago when this was the only type of grinder made to work with water. The revolution which water has brought about in manufacturing grinding is evidence of the soundness of the claim for wet grinding of knives.

Special Grinding Machine

The method of grinding just described produces a hollow or concave face, but the commercial knife grinding machine will grind either straight or hollow face. The main details of this machine can be obtained by referring to the plan view Fig. 3. The wheel used is of cup-shaped construction and should preferably be of a soft, medium coarse grade. The desired reciprocating motion is imparted to the machine table by means of a shifting belt arrangement working similarly to that employed on planers. Slots are provided on the table T by which means the knife can be bolted in position. The table can be swivelled to obtain any desired level and is also made adjustable to the wear of the wheel. The table and supporting bed are mounted on the plate P, which can be turned through a slight angle; the posi-

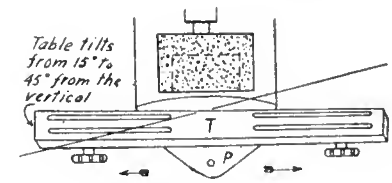


FIG. 3.

tion shown producing a straight ground knife and that indicated by the dash line producing the hollow ground.

Paper Cutting Knife Oddities

An interesting method was noted in a plant having several cutting machines but situated far from any grind centre and having no grinder of their own. A lead "tread" two inches thick was cast around an old pulley and, when turned true, was charged with fine sand. Mounted on an arbor running in boxes on a home-made wood frame and having a "V" in which the back of the knife rested as it was moved along, it made a cheap but very efficient grinding apparatus. A hose leading out from a hogshead of water overhead formed their cooling system. The men in this plant, instead of finishing the edge with a whetstone, used burnishers just as a butcher uses his "steel" for edging. There were six one-inch lengths of 5-16 inch Stubbs' steel rod, hardened and

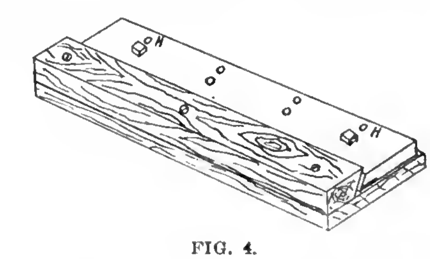


FIG. 4.

polished to almost a mirror surface. The class of cutting was the finest and most particular, and the burnisher seemed to be the correct edging tool.

Safety Devices

Handling a piece of steel of the size and weight of paper cutting knives with their razor-like edge is attended with considerable risk, and the only safe way to carry them or to store them is to have the edge completely covered as shown by Fig. 4.

This device is cheaply and easily made, and it should be used wherever possible as protection is thereby afforded to both the workman and the sharp edge. The knife is fastened in place by the bolts as shown and, when a knife is "packed" in this manner, transportation companies will accept such a package without further boxing.

Another safety precaution which should be considered in working with these knives is to have some means of holding them while they are being removed from the machine. A couple of eyebolts should be screwed into the bolt holes and all handling done by means of these. Many a nasty cut or even a more serious injury will be prevented if such precautions are taken.

Commercial Opportunities

By the installation of a special knife grinder or by providing an attachment to the grinding machine, the small machine shop can substantially increase its income. Advertising must, however play an important part in procuring such business. If the fact is brought to the attention of every cutting machine user within a radius of fifty or one hundred miles, that the shop is in a position to sharpen knives and return them within a day, and stating also a standard price for such work, the user would not hesitate giving his preference to such a shop, rather than send his work to a type foundry or large shop in a distant city. In the latter the work, is in many cases done grudgingly, and the charges made in accordance, while the knife is not generally returned to the user for a considerable time. Then, too, the field may be broadened by getting other machine knives to sharpen—knives from wood planers, knives used in leather and rubber industries, binderies, paper box factories, etc.

Various attempts to enable the printer to do his own grinding have been made but with one exception they have not been conspicuous successes. It is not an unusual sight in a printing office to see a man spend an hour or two whetting up a knife with an oil stone—so much does the printer dislike to have the knife sent away for a few days even though he needs it sharpened. A little device has recently been placed on the market which sharpens a knife right in the paper cutter itself. The cutting stick is removed and the device clamped in this slot. An emery wheel is then moved along by hand thus sharpening the blade. This is so effectual that in cities having knife grinder service this tool is used and though it does not take the place of an occasional machine grinding, it will save four out of five such trips from the office.

A SELF-CONTAINED RADIUS TURNING DEVICE

By George Armstrong

A FORMING attachment of the radius rod type which, with the exception of a small stop bracket fixed on back of lathe bed, is carried on a special cross slide and permits of all necessary adjustments being accurately and quickly made, is shown in Figs. 1, 2 and 3. The regular cross slide is removed from the lathe carriage and a special slide A is fitted, at the back end of which is formed an elongated frame as shown in Fig. 1. Bosses formed in the ends of this frame support rod F, one end of which is provided with adjustment where it comes in contact with bracket I, which is fastened to the bed of the lathe.

The part E, which corresponds to the ordinary tool box is carried in the front end of a radius link, which is formed so as to provide a slideway for tool box E, adjustment being obtained by screw J. The front end of the radius link is pivoted in, and rests on a block L, which slides in guides on the top of cross slide A. The back end of the radius link is pivoted on block D, which is an accurate sliding fit in the frame guides. Rod F is provided with a threaded portion of suitable diameter which screws in block D and also carries lock nuts H. The extended portion to the right carries a strong coil spring which keeps the lock nuts in contact with the frame. A slight relative adjustment of the lock nuts and pivot block enables the radius link to be set exactly at right angles to the centre line of the lathe as shown in Fig. 1.

With the parts in this position the carriage may be moved to either side

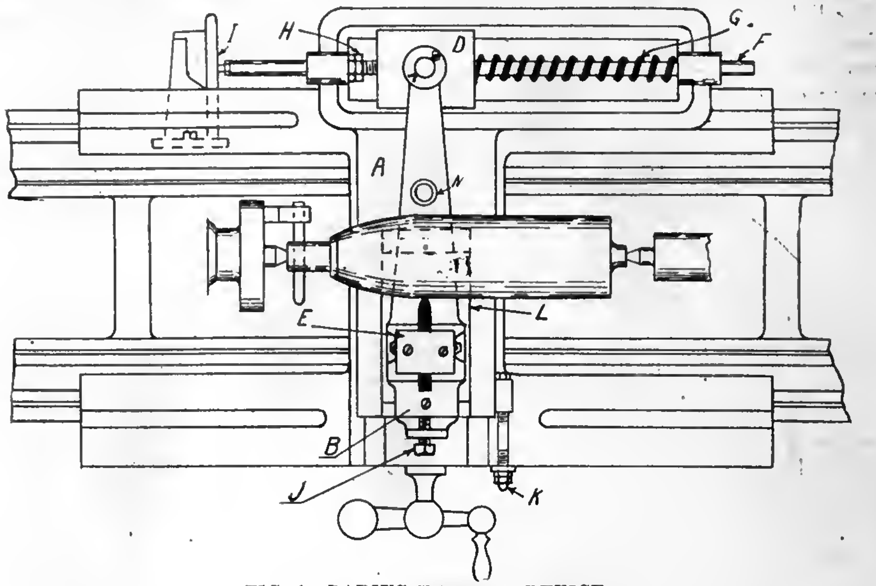


FIG. 1. RADIUS TURNING DEVICE.

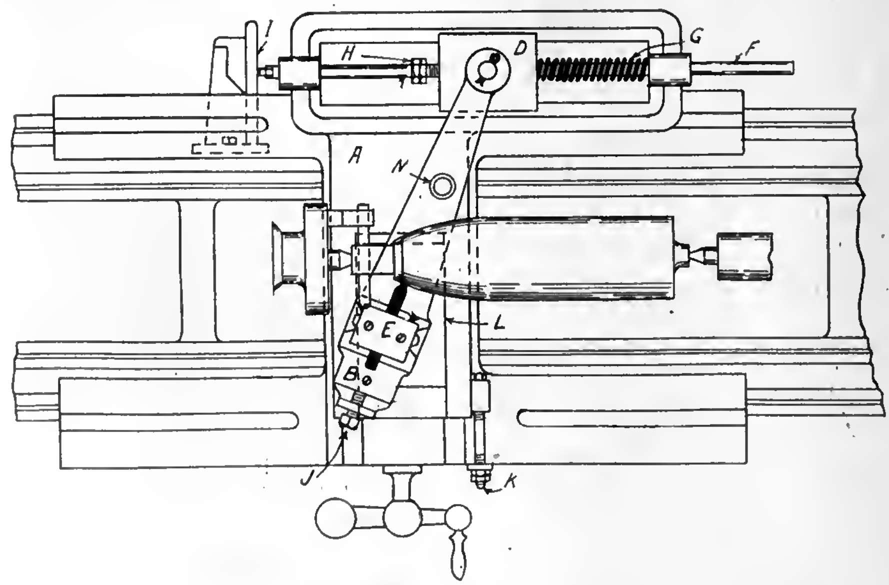


FIG. 2. RADIUS TURNING DEVICE.

and parallel turning done, the diameter being controlled by the ordinary feed screw retained in place. The carriage having traveled to the left and reached the position shown in Fig. 1, the rod F comes in contact with bracket I, and remains stationary, while the carriage continues traveling. Block D being fastened to the rod F, now becomes a fixed point from which the radius link swings, till it reaches position shown in Fig. 2.

The actual length of radius imparted to the curve is controlled by adjusting screw J, while the setting of the tool to a definite size is quickly done with the gauge M, Fig. 3, which fits over stud N, and gauges the point of cutting tool.

In returning the carriage to base end of shell, the coil spring G keeps rod F against bracket I, until the movement of the carriage to the right brings the end of the frame in contact with the lock nuts after which parallel cutting proceeds in the usual manner.

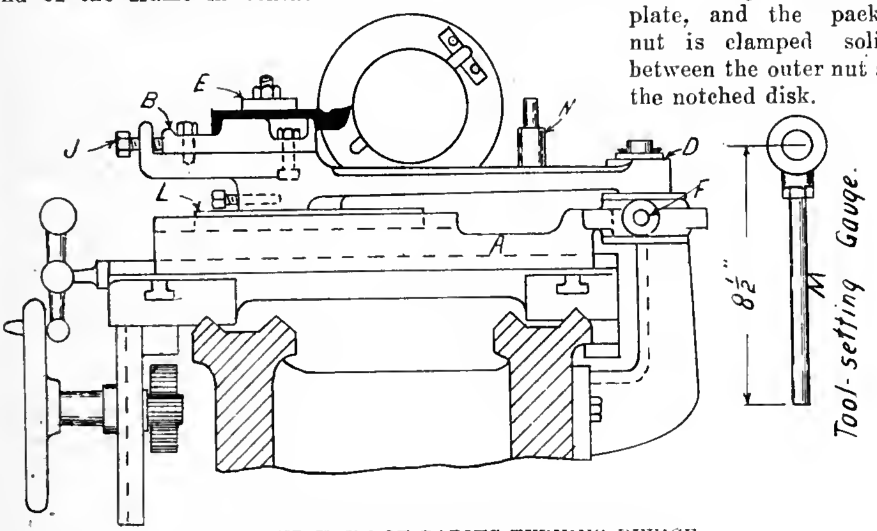


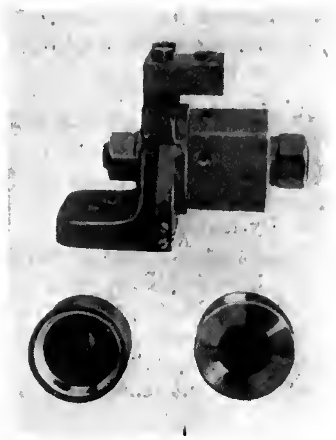
FIG. 3. END VIEW OF RADIUS TURNING DEVICE.

A feed stop K provides means for accurate duplication of diameter.

DRILLING PACKING NUT SPANNER HOLES

By A. E. G.

THE little jig shown has saved us a good many dollars. Before we made it we used to prick punch the holes approximately all around, and then hold the nut by hand on the small sizes, and on the larger ones we used a vise. The jig shown was made large enough to accommodate all the sizes we make. Two of the nuts are shown in the foreground and another in place in the jig. A shouldered disk next to the angle plate of the jig serves to locate the nut central over the holding stud around which it revolves. This shouldered disk is notched around the edge to correspond to the holes to be drilled. A spring latch engages these notches strongly enough to hold the disk and work securely in place while drilling, yet it is easily sprung out while indexing for the next hole. The stud itself is shouldered so as to turn easily in the angle plate, and the packing nut is clamped solidly between the outer nut and the notched disk.



DRILLING PACKING NUT SPANNER HOLES.

AN INEXPENSIVE LATHE GUARD

By D. S. Mann.

FOR a cheap and at the same time effective lathe guard, that shown in the photo has worked out very nicely, and all the lathes in one shop are thus equipped. The frame is constructed of 1 in. by 10 in. planed lumber, or narrower, for the smaller lathes. This is hinged to the floor at the bottom, the strap hinges being attached to the bottom cross bar. Heavy mesh screen is placed over the upper portion protecting the gears. To the middle cross bar is attached a ⅜ in. rod fitted with an eye at the upper end, and held in place by a staple. When the frame is pushed outward, this rod, of course, remains vertical and comes in contact with the floor, thus supporting the guard without the operator having to give the matter any attention. The guard is caught by the rod at an angle of about 45°, and there is thus no danger of the guard being tipped clear over and broken even if given a violent push. In order to better show the construction the guard in the photo has been pushed slightly outward.

INEXPENSIVE LATHE GUARD.

CONTROL EQUIPMENT FOR MACHINE TOOLS

THE increasing employment of the electrical drive in industrial establishments has brought with it special problems. In a majority of cases the workman who is in charge of a machine tool is not an electrician, and now that so many partially trained workmen are being employed on work previously carried out by skilled men, the need for simplifying the control equipment of machine tools has become more urgent.

One great advantage of driving machine tools by individual motors is that speed variation is made possible. It is essential, however, that the control gear should be of the simplest character or else the ordinary operator would be frequently in difficulties. Several equipments of this character have been developed by the British Thomson-Houston Co., London, England.

Four main types have been evolved a non-reversible form without dynamo-breaking, a similar control with dynamo breaking, a reversible control without dynamo breaking, and a similar control with dynamo breaking. One feature common to all these is the accelerating unit which is automatically devised to give full protection to the motor, and to ensure that the machine stops or starts in the shortest possible time.

Although the equipments are for constant speed machines they can be used for variable speed motors in conjunction with a field rheostat and relay. The system is designed for capacities in the case of reversible control up to 10 h.p. at a pressure of 550 volts. The non-reversible equipments are supplied in powers ranging from 15 to 25 h.p. at varying pressures. The controllers for the equipment are three-way drum controllers fitted with magnetic blow out coils.

Series of Practical Questions and Answers for Mechanics

Every care is being taken to include only pertinent practical questions, and give same direct, reliable answers. Catch questions will be avoided. Arithmetic, consisting of simple addition, subtraction, multiplication and division will be found a useful companion study.

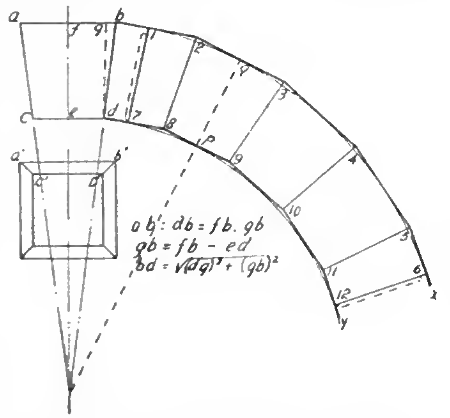
Question.—The ram of a large slotter with its parts weighs approximately 235 lbs. If the arms of the balancing lever are of equal length, what must be the diameter of the balance weight if its length is 18 inches?

Answer.—As the arms of the lever are of equal length, the weight of the balance will be equal to that of the ram, or 235 lbs. The volume of the weight will be $235 \div .26 = 903.846$ cubic inches, and the area of the cylinder end will be $903.846 \div 18 = 50.213$ sq. in.; therefore, the diameter will be $\sqrt{\frac{50.213}{.7854}} = \sqrt{63.93} = 7.995$, or approximately 8 inches.

• • •

Question.—We have a sheet metal tank to construct, the body of which is to be of one piece, and forming the frustum of a square pyramid. The dimensions are to be one foot high, one foot square at top and nine inches square at bottom, with the seam on the centre of one of the sides. What will be the shape of flat blank?

Answer.—To obtain the development of the blank by the graphical method, it is first necessary to have an elevation of the tank a, b, c, d. The intersection o



of the centre line e f and the slope line b d will be the centre of the arc from which the blank is obtained. To find this radius by calculation, we first extract the square root of the sum of the squares of g d and g b; or from the equations shown in the cut, we have $gb = fb - ed = 6 - 4.5 = 1.5$, then $bd = \sqrt{(dg^2 + gb^2)} = \sqrt{(12^2 + 1.5^2)} = \sqrt{146.25} = 12.09$. Therefore, from the proportion $ob : db = fb : gb$, we have $ob = \frac{db \times fb}{gb} = \frac{12.09 \times 6}{1.5} = 48.36$ inches. Now, with radius o b, describe the arc b x, and with radius o d, describe the arc d y. Draw the radial line o q, and from the points p and q draw lines tangent to the respective arcs. By laying off the distance a b around the outer arc and drawing the radial lines 2, 8 and 3, 9, etc., also the lines 1, 7 and 6, 12, the development of the blank is obtained. Allowance for seam (as shown by the dotted lines) should be made at each end of the blank.

• • •

Question.—We have a number of blocks to cup-out on the lathe, the cup to form the segment of a sphere; the chord of the segment or diameter of the cup to be 12 inches, and the depth $1\frac{1}{2}$ inches. What will be the radius with which to strike a gauge, and is there any method that can be employed to operate the tool, so as to develop the correct shape?

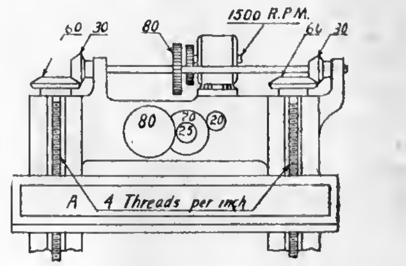
Answer.—The desired radius can be obtained by the formula in which the height of the segment is to half the chord, as half the chord is to the diameter minus the height of the segment, or $1.5 : 6 = 6 : (d - 1.5)$. Then $(d - 1.5) = \frac{6 \times 6}{1.5} = \frac{12}{.5} = 24$, and $d = 24 + 1.5 = 25.5$ inches. The radius will, therefore, be $25.5 \div 2 = 12.75$ inches.

To shape the bowl, a single-pointed tool will require to travel through an arc formed by a $12\frac{3}{4}$ inches radius. A simple, yet fairly accurate method to perform this operation is to make a deep centre punch mark in the tailstock and one in cross slide of the saddle; these should be in the same horizontal position and as close as possible to the centre of each when the cutting tool is in the centre of the work. To operate, have the compound rest set parallel to the lathe spindle for tool adjustment. Obtain a rod of about half-round iron, well pointed on the ends (to enter centre marks) and equal in length to the desired radius, and, with the tool set at the outer end of the arc, secure tailstock in position, so that the rod will enter both centre holes. Advance tool to the work with compound rest, and feed over the cross slide. The action of the radius rod will gradually advance the saddle (which is free to move), causing the tool to cut the desired arc.

• • •

Question.—With the motor running at 1,500 revolutions per minute, and the other dimensions as shown in the sketch, what time would it take to raise the cross bar A 3 feet?

Answer.—The speed of the driving shaft multiplied by the number of teeth in all the driving gears will equal the



speed of the elevating screws multiplied by the number of teeth in all the driven gears; or, taking x as the speed of the housing screws, we have $1{,}500 \times 20 \times 25 \times 30 = x \times 70 \times 80 \times 60$, or $x = \frac{1{,}500 \times 20 \times 25 \times 30}{70 \times 80 \times 60} = 67$ r.p.m. Therefore, the time required in raising A 3 feet would be $\frac{4 \times 12 \times 3}{67} = 2.15$ minutes.

• • •

Question.—What are the specific purposes of the shrapnel and high explosive shells as now being manufactured in Canada and elsewhere?

Answer.—The chief object of the shrapnel shell is that of human destruction, while that of the high explosive is the destruction of material. The action of the shrapnel shell is that of an aerial gun. When the shell is discharged from the field piece, the fuse is ignited by the action of suitable mechanism, and when the burning fuse reaches the powder at the base of the shell chamber, the charge is exploded. This explosion takes place behind a steel diaphragm, which acts as a piston in its movement towards the mouth of the shell, forcing the charge of small lead bullets and resin through the open end of the shell, in a similar manner to that of an ordinary shotgun. At the moment of shrapnel discharge the velocity of the bullets is increased over that of the shell about 600 to 800 feet per second. Adjustments for range are made so that the discharge takes place a short distance in front of the troops or trenches.

High explosive shells are usually discharged upon striking the desired object, and the construction is such that when the high explosive charge is ignited the shell is shattered into fragments, causing

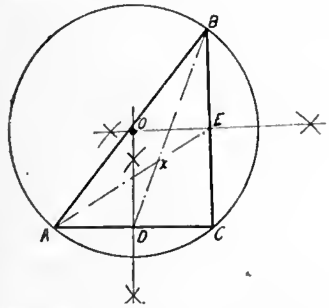
destruction to all material within a certain area.

* * *

Question—(a).—We have a large cast iron beam, several feet long and triangular in cross section, with sides of 14, 11 and 9 inches; where would we put a centre on the ends, so that the cutting tool would take an equal amount off each edge?

(b).—Where would this centre be placed so that the casting would be evenly balanced in any position?

Answer—(a)—This comes under the geometrical proposition of describing a circle about a triangle. The intersection



o of two perpendiculars erected from the middle points D and E of two of the sides will be the point equally distant from the three corners A, B and C.

(b)—Where the cross section is the same throughout the entire length, the point of suspension will be the centre of gravity of the triangular end. To find this point, draw lines from the apex of the angles to the middle point of the opposite sides. The intersection x will be the point desired.

* * *

Question.—In the series of questions and answers there arise many solutions involving the extraction of the square and cube root. Enlightenment is wanted for the method employed for finding these roots?

Answer.—To become familiar with the method of extracting the roots of numbers, it would be necessary for a beginner to obtain a treatise on this subject, as it is only by frequent practice that one can become thoroughly conversant with the processes. However, to illustrate the method generally adopted, we will first square a number and then reverse the process. To find the square of 213 we multiply it by itself, or $213 \times 213 = 45{,}369$. Now to extract the square root of 45,369, or by using the sign (called the radical sign) $\sqrt{45{,}369}$, we divide the number into divisions of two periods each, commencing from the unit or right-hand digit, thus: 4|53|69.

We then find the nearest number whose square is less than 4 and place it to the extreme right, as the first figure of the quotient, also to the left for a divisor, thus:

```
2   4|53|69   2
```

Now multiply the divisor by the quotient and place below the first period in the number and subtract, thus:

```
2   4|53|69   2
    4|
    —
```

Afterwards bring down the next two figures of the number, add the last figure of the quotient to the divisor, and multiply by 10 for a trial divisor, thus:

```
 2   4|53|69   2
 2   4
 —   ——
40   53
```

Divide the new dividend by the trial divisor, and add the result to the trial divisor to get the true divisor; then proceed as in common division, thus:

```
 2   4|53|69   21
 2   4
 —   ————
40   53
 1   41
 —   —
41   12
```

Add the last figure of the quotient to the last divisor and multiply by 10 for trial divisor, and bring down the next period of the number, thus:

```
  2
  2
  —
 40      4|53|69   21
  1      4
  —      ——
 41       53
  1       41
 ——      ——
420      1269
```

Proceed as before, trial divisor into new dividend, add to trial divisor for true divisor, and so on as before, thus:

```
  2
  2
  —
 40
  1      4|53|69   213
  —      4
 41      ——
  1       53
 ——       41
420      ——
  3      1269
 ——      1269
423      ——
```

The process is now complete, and the $\sqrt{45369}$ equals 213. This may seem a lengthy method, but when familiar with the principle, the time of solution is quite short. The method of extracting the cube root will appear in an early issue.

* * *

Question.—The accompanying sketch shows the layout of the rolls on a three-high, two-pass mill. If the stock, as it comes from the rolls D is of 1 inch diameter and is produced at the rate of 220 feet per minute, with a reduction in each case of approximately 25 per cent. in cross sectional area, what would the various roughing diameters of stock be, and the speed of the three sets of rolls, mean diameter of rolls being 14 inches?

Answer.—To deliver stock from the lower rolls D at the rate of 220 feet per minute, mean diameter of rolls being 14 inches, the speed of this set would be:

$$\frac{220 \times 12}{14 \times 3.1416} = 60.02, \text{ or approximately } 60$$

revolutions per minute. With a finished diameter of one inch, the volume of stock passing through the rolls would be

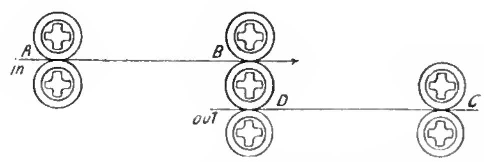
$.7854 \times 220 \times 12 = 2{,}021$ cubic inches.

Now, to avoid any undue pull or buckle between the two sets of rolls C and D, it will be necessary for the rolls C to revolve at a certain speed, so that the volume of stock delivered will be the same as that from the set D, or 2,021 cubic inches. As the reduction in each case is 25 per cent., the cross sectional area of stock between the set C and D will be

$$\frac{.7854 \times 100}{75} = 1.0472 \text{ sq. in.}$$

Length of stock delivered per minute $= 2021 \div 1.0472 = 1{,}929$ inches, or 160 feet per minute. Therefore, the speed of set C would be $1{,}929 \div 43.98 = 43.86$, or 44 revolutions per minute.

With a similar reduction the cross sectional area of stock coming from set B would be 1.396 sq. in., and the length of stock delivered per minute would be the



same as the finished material, as the three-high set is running in unison. Cross sectional area of stock as it comes from rolls $A = \frac{1.396 \times 100}{75} = 1.861$ sq. in.

Length of stock delivered per minute $= 2021 \div 1.861 = 1{,}086$ in. $= 90.5$ feet.

Speed of set $A = 1086 \div 43.98 = 24.6$ rev. per minute.

Cross sectional area of stock as it enters first set of rolls will be $\frac{1.861 \times 100}{75} = \frac{7.444}{3} = 2.481$ sq. in.

I am operating a steam plant but find it almost impossible to keep the boiler from foaming. The boiler feed water is drawn from a deep well bottomed on rock. The water is clear, little sediment or matter in suspension being apparent. The boiler is an old-fashioned affair. Suggestions as to preventing the foaming trouble are requested.—Service.

The "Fairbanks-Morse" 26-Inch H.D. Manufacturing Lathe

Staff Article

A machine capable of efficiently utilizing all of the power which an 8-inch belt will transmit, and possessing interesting features of design and construction calculated to extend its productive existence for an indefinite period, with a constant degree of accuracy, a minimum cost for upkeep and maintenance, and a relatively high ultimate value.

FOR the past eighteen months the machine tool builders of Canada and the United States have been subjected to a demand for their product which has never before been equalled in the history of either country either as regards urgency of delivery, or quality required. During the past year, developments in domestic trade of the States have added largely to this demand, throwing delivery dates so far back that firms in other engineering lines have found it desirable to engage in the production of certain machine tools the demand for which still largely exceeds the supply. Amidst the plethora of single purpose machines for shell work, and manufacturing lathes for general requirements, a few outstanding examples of skillful design and thorough workmanship have shone forth, particularly in the production of heavy duty lathes possessing sufficient power and rigidity to utilize high speed steels to their limit, and accurate enough to produce work within required limits.

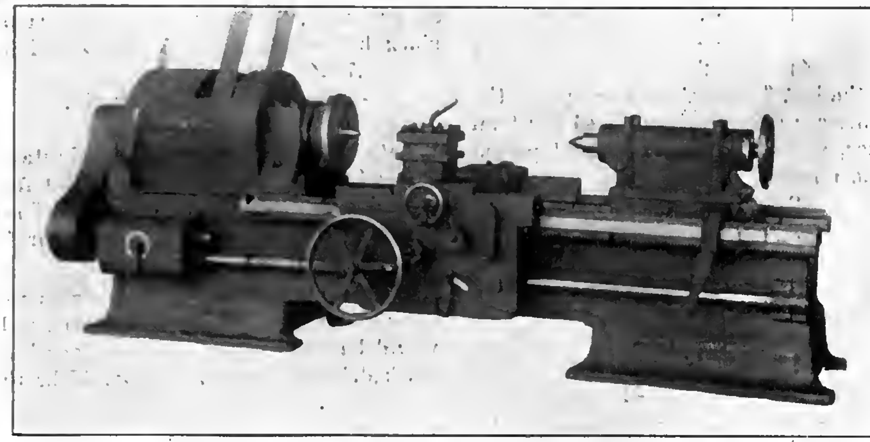


FIG. 1. 26-IN. HEAVY DUTY MANUFACTURING LATHE EQUIPPED FOR PLAIN AND SPECIAL TURNING OPERATIONS.

Requirements and Capacity

One of the more recent entrants into this field is the Canadian Fairbanks-Morse Co., Ltd., who for some time have been producing a 26 in. lathe which, while primarily adapted to special purpose requirements, is eminently suited for general production work requiring power and precision. This latter feature has been kept strongly in view throughout the entire design so that, however well the machine may be suited to the special requirements of immediate customers, its value at a later date will be enhanced by the features referred to. Through the courtesy of the Company we are able to place before our readers particulars regarding the design and construction of this machine.

The capacity of the lathe is 26 in. swing over shears, 18 in. swing over carriage, with a length of 5 ft. between centres on a 12 ft. bed. Weight approximately is 15,000 lbs., while floor space required is 13 ft. x 4 ft. 6 in.

Headstock and Countershaft

Headstock is of the single pulley type with two back gear sets which, along with the open spindle drive, give three self-contained speeds. The countershaft is provided with two friction drive pulleys which render available a total of six spindle speeds. These pulleys take a 9 in. belt and have a special driving flange provided for engaging with the expanding metal driving band. The anchor bracket which carries the expanding gear is keyed to the shaft, and has a sleeve extension which forms a bearing for the pulley, thus avoiding that excessive wear of the shaft which almost invariably happens when loose pulleys are run on the bare shafts.

Compression grease cups insure ample lubrication for the loose pulleys. The cups being mounted on the anchor brackets so that they can be tightened up at any time when the countershaft is at rest. Where the cups are fitted to the pulleys, they can only be tightened when the line shaft is stopped at meal hours, or else the belt must be thrown off. Much can be said in favor of the arrangement adopted, not the least being the increased safety for the workman, and the ability to supply extra lubricant immediately any trouble arises.

The headstock driving pulley takes an 8 in. width of belt, and has a diameter of 20 in. Fig. 3 shows the principal details of the headstock from which it will be seen that the pulley is mounted on a bronze sleeve carried by the spindle. Two integral pinions having 40 teeth and 33 teeth, are formed on this sleeve and when meshing with their corresponding back gears, provide intermediate and low speeds having approximate spindle ratios of 8 to 1 and 11 to 1 respectively. The intermediate speed back gear is carried on the extended boss of the low speed sliding back gear, which is feathered to the quill and has a groove on its opposite side engaging with a lever on the end of the speed change shaft. The quill gear is cut from the solid, the quill itself being bronze bushed at both ends, while the eccentric shaft on which it revolves is operated by a hand lever with spring plunger for accurately locating the gears when in mesh.

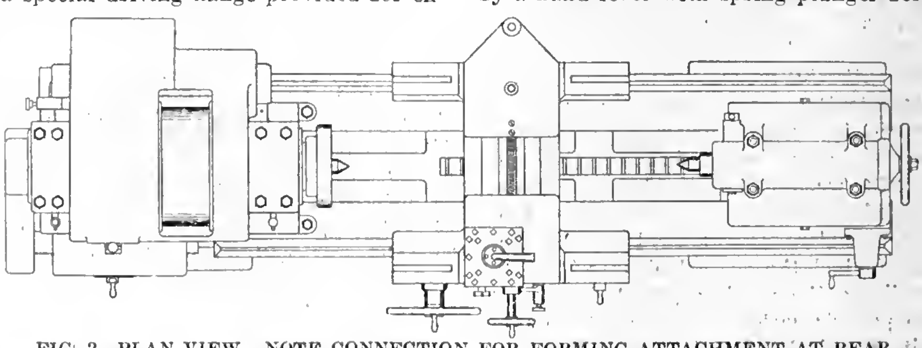


FIG. 2. PLAN VIEW. NOTE CONNECTION FOR FORMING ATTACHMENT AT REAR OF CROSS SLIDE.

The spindle is of exceptionally liberal proportions, the diameter of the front bearing, 8 in., being almost 1-3 of the

maximum swing. This bearing is 10 in. in length and is provided with two oil rings and a well of large capacity. The rear bearing is 6 in. diameter x 8 in. long with one oil ring. Both bearings have check grooves which prevent the oil from creeping along the spindle. The drive to the spindle is through a 67-tooth 3-pitch gear having 4½ in. width of face. When running with direct drive this gear is locked to the pulley with a 1 and 17-16 in. pin which engages with a driving ring mounted in the side of the pulley. By this arrangement the power is transmitted directly from the belt to the spindle without subjecting the pulley or sleeve to stresses such as are liable to occur through the operation of clutches and similar mechanism. The intermediate and low speed gears are 4-pitch x 4 in. face, of forged steel. A thrust bearing of steel and bronze plates is provided at the near bearing, while a is provided at the rear bearing, while a No. 6 Morse taper centre with adapter being fitted.

Feed Changes

Four changes of feed are provided, these being obtained through four pairs of gears as shown in Fig. 4 .

The upper or drive shaft carries four fixed gears, and is driven from the spindle by spur gears mounted on a quadrant of conventional design. The lower or feed shaft derives its motion from the drive shaft through a double sliding gear provided with clutch teeth on each end. Two of the four feeds are obtained by meshing either of the sliding gears with its mate, while the other two feeds are obtained by engaging either clutch with the end gears on the feed shaft, these gears being free on the shaft and constantly in mesh with the end gears on the drive shaft. The sliding gear is operated by a rack and pinion as shown, neutral positions for the hand lever being provided between each feed.

Feeds regularly fitted are 1-32, 1-16, 3-32, and 1-8 in., any desired maximum up to ⅜ in. being obtained through changing the gears on the quadrant.

Carriage

The carriage has generous proportions in keeping with the remainder of the lathe, having a width of 16 in. over the bridge and 40 in. length of bearing on the vees. It is scraped to a bearing over the full width of the shears. A double gib-plate under the bridge, in addition to the regular plate under the back vee enables back cutting tools to be used to advantage. The cross slide screw is specially arranged to permit of rapidly altering its action when doing contour work. The back end of the screw is supported by and secured to a bearing attached to a movable plate gibbed to the cross slide, the plate being positively located by a stop pin when using the cross slide in the ordinary way. When used for forming contours such as shell noses, etc., the stop pin is withdrawn and the portion of the plate which projects over the back of the lathe is connected up with the copy bar by means of a roller and pin.

Power feed through a friction drive is provided for the cross slide block which carries a four-sided revolving turret tool post. This post is shown clearly in the photograph, Fig. 1, and also the arrangement of handwheels and levers on the apron. The tool post will accommodate tools up to 2 in. x 1 in.

Carriage Feed Gear

The feed gear drive is through a 1 11-16 in. shaft, with reverse gear in the apron, see Fig. 5. The bevel pinions are free to revolve on feed shaft and are constantly in mesh with the large level gear. Each pinion is formed on the outer end of a separate sleeve, the inner ends of these sleeves having flanges which fit between the bearings as shown and prevent end play of the pinions. Clutch teeth on the end of pinions engage with sliding clutches on the feed shaft. These are operated by forks carried on two rods, the lower one being operated by the lever in front of the apron.

Feed stops are provided in either direction, the clutch knock out being actuated by an adjustable collar on the feed shaft, between which and the clutch frame is placed a suitable length of tubing to keep the collar in view at the end of the apron. Provision is made for installing a split nut for use with a splined lead screw. The lower rod of the clutch frame is utilized for interlocking with the nut to prevent simultaneous engagement. The apron is of the double type, providing a support at each end of the various gear shafts, including the rack pinion. The carriage is clamped in position by a lever on the front of the carriage operating by means of a cam. The cross feed screw if fitted with a graduated hub, and large handwheel 20 in dia., is provided for carriage traverse.

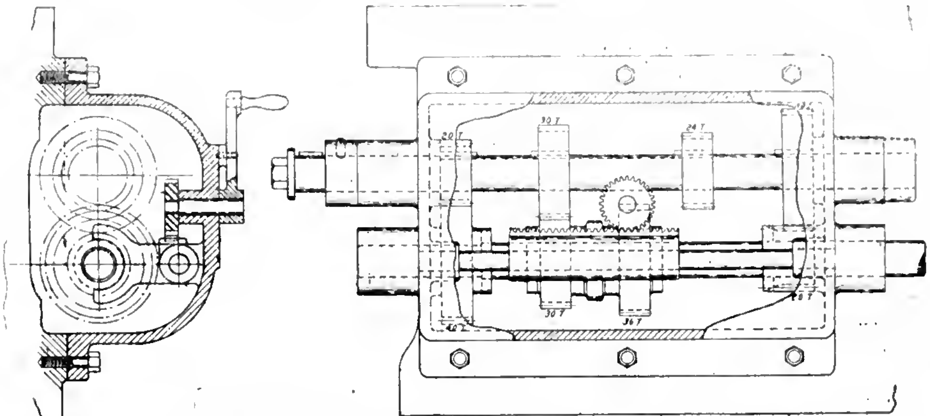


FIG. 4. FEED CHANGE GEAR BOX SHOWING SLIDING GEARS ON FEED SHAFT.

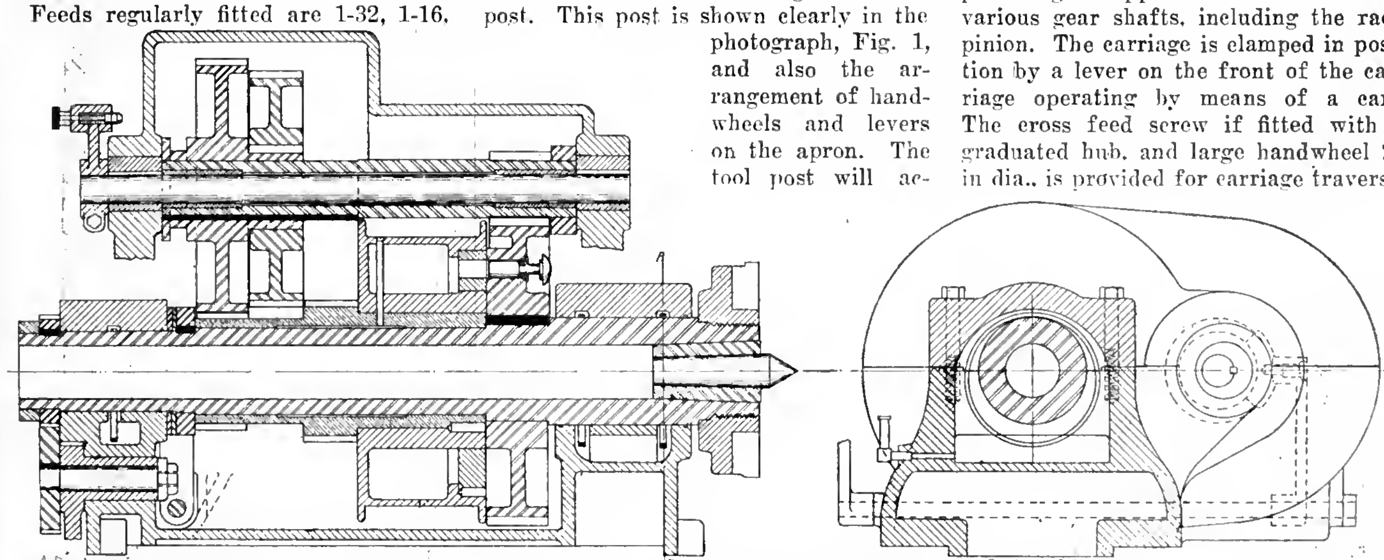


FIG. 3. SECTIONAL ELEVATION AND END VIEW OF HEADSTOCK WITH ELEVATED PLAN OF BACK GEARS.

Tailstock

The tailstock spindle has a diameter of 4 in. with a total length of 25 in., the useful travel for operating purposes being about 14 in., and a No. 6 Morse taper centre being fitted. A renewable bronze nut is provided for the screw to operate in, the latter being 1 1-16 in. diameter x 4 threads per inch. The tailstock casting is tongued to the base for offsetting in taper work and is clamped in position by four 1⅛ in. bolts, located close to the ends. Additional security is obtained by the hinged sprag engaging with the rack cast on the bed girder. The clamping arrangement for the spindle employs two cylindrical wedge blocks drawn together by the screw shown in Fig. 6, thus avoiding splitting the end of the casting as done in many cases. A 12 in. lever on the screw shaft enables this clamp to hold against any pressure likely to occur in use. Rack and pinion traverse is provided for moving tailstock.

The lathe bed is of excellent proportions being 31 in. wide over the vees, and 20 in. deep. Three box section cross girths along with the longitudinal girder stay referred to, provide stiffness calculated to insure a maximum degree of accuracy.

Particular attention has been given to lubricating facilities. The bronze sleeve on spindle is chambered out to form an oil reservoir which is replenished through a tube in the belt pulley as shown in headstock drawing. All change gear studs have drilled passages for conveying oil to the required places. A similar arrangement is applied to the back gear quill, oilers, sight feed lubricators, etc., being applied wherever they are best fitted to insure continuous operation and minimum depreciation.

BRASS FINISHING

AT a recent meeting of the North-Western Section (England) of the Junior Institution of Engineers an informal discussion on "Brass Finishing" took place. Steam engine, boiler and ship work fittings were dealt with, the chief advantages enjoyed by a firm possessing its own foundry being defined as follows:

The mixings, pouring temperatures and pouring "heads" may be carefully controlled with a view to the obtaining of high tensile strength, fine-grain metal which may be machined to a good finish and toughness (10 p.c. elongation being the Admiralty minimum, but 20 p.c. often being obtained in practice). During the mixing, it was stated, the following facts should be borne in mind:

Excess of copper results in hardness, tin gives tensile strength, lead cheapens and softens, and other metals or substances other than zinc or arsenic result in risk of porosity and blowholes.

The author described light direct (not back-geared) driven lathes and capstan lathes as the brassfinisher's most useful tools; the most essential point, where good tooled accurate finishes are necessary being extreme rigidity of all parts of the machines. Bearing shells were exhibited, these being finished to plus or minus 0.0005 inches in such a way that any two halves would pair.

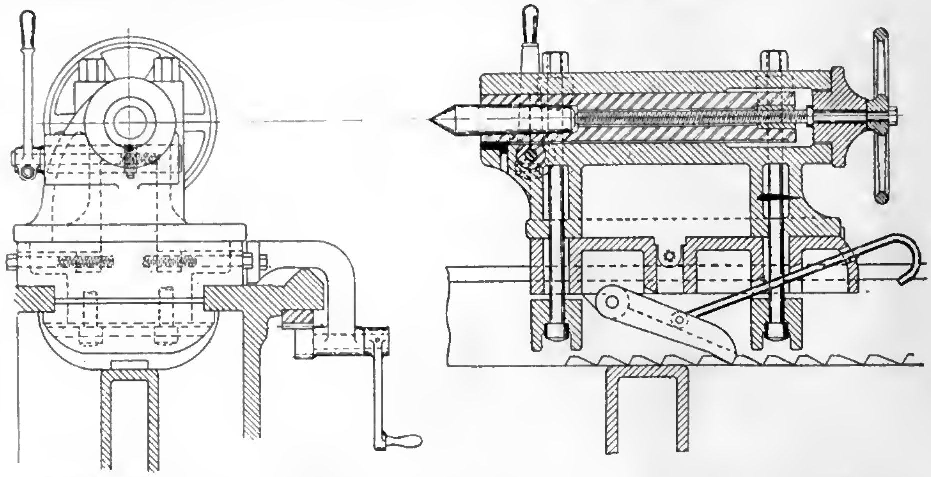


FIG. 6. FOUR BOLT TAILSTOCK WITH SPRAG AND HAND TRAVERSING GEAR.

Montreal Harbour Development. — Under a Federal Act passed some time ago, the Harbor Commission of Montreal are entitled to loans from time to time from the Government to defray the cost of increased facilities for handling the growing trade of the port. The Government recently authorized a small advance to provide for the continuance of the work under the statute. An Act passed in 1914 authorized the making of advances up to a total of nine millions, which was stated at that time to be sufficient to meet the requirements of the port till 1918. Only a part of the total has been advanced. Previous legislation in 1910 and 1912 had provided for advances up to $12,000,000.

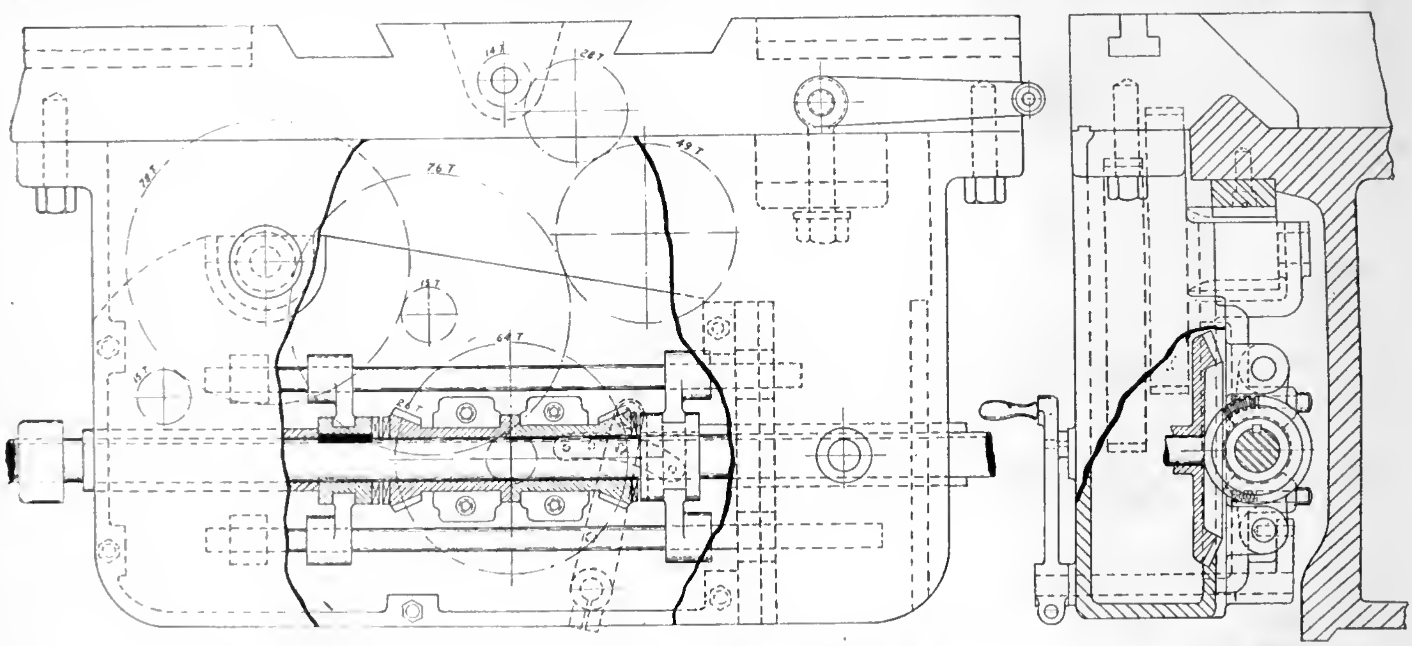


FIG. 5. PART ELEVATION OF APRON SHOWING SEPARATE CONSTANT MESH BEVEL PINIONS DRIVEN THROUGH DOG CLUTCHES.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

MECHANICAL BELT SHIFTING DEVICE

LATHE users are becoming more and more alive to the necessity of using tool steels at the highest speed suitable for the work being done, and the frequent shifting of belts involved has created a considerable demand for belt shifting appliances which operate quickly and safely.

The Diamond Speed Shifter shown in accompanying illustration will move a belt from any one step to any other in a few seconds by means of the two levers which the workman is shown operating. In operating this device for increasing the speed, the right hand lever is moved to the left thus slipping the belt on to a smaller step of the cone, after which the left hand rod is revolved so that the fork at its upper end swings round and causes the belt to mount up the steps of the cone till it reaches the speed desired. In reducing speed, the operations are performed in reverse order.

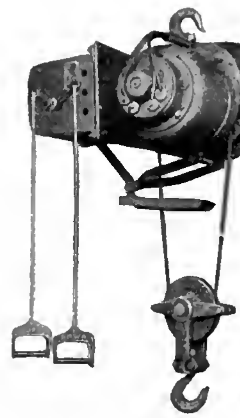
The action is positive and eliminates the use of a pole with its frequent delays, and troublesome effort. The operator does not touch the belt with his hands, consequently the possibility of accident is removed. The capacity of the machine is largely increased as the ease of changing persuades the operator to vary his speed as required with greater frequency than when using the pole.

The Dearborn Steel & Iron Co., Chicago, are distributors of this device which can be quickly and easily attached to any existing lathe, and is accepted in lieu of guards by many state factory inspectors.

MECHANICAL BELT SHIFTING DEVICE

PORTABLE ELECTRIC HOIST

THE accompanying illustration shows a portable electric hoist designed for use in locations where it can be suspended by a single hook, or when required can be attached to an overhead trolley or crane and moved from place to place.



PORTABLE ELECTRIC HOIST.

Owing to the limits imposed on such machines by the requirements of portability and compactness, the makers have used straight standard cut spur gears throughout. These gears are forged steel, heat treated, and completely enclosed, permitting ample lubrication during operations. An enclosed mechanical disc brake and a motor brake are used on all sizes. An automatic limit device stops the hook at top of lift.

The Northern Crane Works, Ltd., Walkerville, Ont., supply these hoists in a variety of types for use with either alternating or direct current.

NEW TYPE WORM GEARING

TO obtain a more perfect contact between the thread of the worm and the teeth of the worm wheel and increased load carrying capacity between the two gears, Percy Brown, of Park Gear Works, Huddersfield, in conjunction with F. J. Bostock, has designed and patented the arrangement shown in Figs. 1-3, the former being an elevation of the worm; Fig. 2 a similar elevation of the worm partly in section and of a fragment of a worm wheel in mesh therewith, the worm wheel being in section taken midway across the width of the teeth; and Fig. 3 an end elevation of the worm.

The invention consists in providing the thread of the worm with a surface every part of which contains a straight line passing from the root to the crest thereof and forming an oblique tangent to a cylinder along a helical line of contact at a constant angle, as indicated on each side of the worm thread by the dotted lines A and B in Figs. 1 and 3. The cylinder may be that of the worm at the base of the thread or may be of smaller or larger diameter. The teeth of the worm wheel C at a point midway across the width of the teeth are in cross-section formed with substantially straight side or surfaces D at the desired angles, as shown at Fig. 2. The thread of the worm shaped as above set forth admits of a more perfect contact being obtained between the thread of the worm and the teeth of the worm wheel, because when such a tooth shape is in working contact with a wheel whose tooth sides are substantially straight in medial section, these two shapes very closely approximate each other; hence when a load is applied, the elasticity of the metal provides for a contact of greater area than is ordinarily obtainable, and consequently gives an increased load carrying capacity between the two gears.

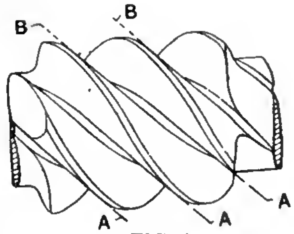


FIG. 1.

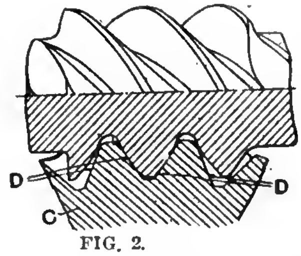


FIG. 2.

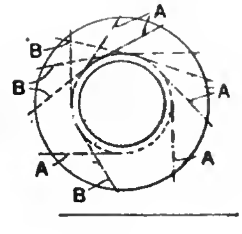


FIG. 3.

OUTPUT OF MUNITIONS IN FRANCE

THE British Ministry of Munitions recently issued as a White Paper the report of the Commission appointed by the Director-General of Recruiting for Munition Works on the output of munitions in France. The members of this mission were:—J. T. Brownlee, chairman of the Amalgamated Society of Engineers, and member of the National Advisory Committee and Central Munitions Labor Supply Committee; two members of the Ministry of Munitions, Alexander Duckham and D. J. Shackleton (Labor Adviser), also Allan M. Smith, Secretary of the Engineering Employers' Federation and Member of the Central Munitions Labor Supply Committee. Attached to the mission were two engineers of wide experience in the manufacture of war munitions.

The object of the mission, which had the hearty approval of M. Albert Thomas, the French Minister of Munitions, was to visit the industrial districts of France and report on the causes which have contributed to the enormous increase which has taken place in the production of munitions in that country, notwithstanding that one-eighth of the country and five-eighths of the former metallurgical productivity are in the hands of the enemy. The general conclusions at which the mission have arrived are: — The people of France realize that they are at war. The one idea in the mind of all is to bring the war to a successful issue. The spirit which dominates the nation has prevented difficulties arising in the manufacture of war material. Loss of time is practically negligible. No trade union restrictions exist at the moment. Everything is done to increase production. No limitation of profits exists, and no question in this respect has been raised by the workpeople. The manner in which the employers of France have been able to acquire machinery and the initiative and energy displayed by them are beyond all praise.

No factories have been subsidized by the Government, nor have loans of any kind been made to the owners. The owners have, at competitive prices, taken orders from the Government, and on the strength of these orders have purchased land, built factories, procured machinery and now depend on the contract prices for re-imbursement of their outlay and for gaining the profit to which they are entitled. Remarkable success has attended the efforts of a number of employers who have abandoned their normal manufacture and adapted their machinery for the output of munitions.

A feature of the French system is the fostering of the small producer for machine operations.. Of these there are about 1,800 in the Paris district. The work let on sub-contract is paid for at the price the main contractor receives from the Government, and no profit is made by the main contractor out of the work sub-contracted. Many small shops are manned by various members of a family and work day and night shifts.

Practically all the factories run night shift as well as day shift. In some cases the hours are divided into three shifts. Those on the two-shift system have one break in the day. The usual starting times are 6 a.m. to 7 a.m. A break of one to two hours (averaging one and a-half hours) takes place at noon, and the day shift continues until 6 or 7 p.m. The long break in the middle of the day enables the women to look after the meals and comfort of their children at home and is highly valued on this account. On night shift usually 10 hours are worked, one hour is generally allowed for a meal, but this is usually taken at the machines, and where the period is half an hour it is paid for, and in few cases is the machinery stopped.

In most cases the shifts change over every fortnight, and on the change the workpeople get 24 hours off. No difference is made in the case of Saturdays, the same hours being worked as on other week days. In some cases no work is done on Sundays after noon. This gives an additional time for carrying out necessary repairs, etc. In the form of an appendix the report gives a statement showing the number of hours worked per week in munition factories in France as follows:—

Two-Shift System

Day shift. — Morning start varies from 6 a.m. to 7 a.m., mean 6.30 a.m.; morning period, 4½ hours to 5½ hours, mean, 5 hours 6 minutes; mid-day break, 1 hour to 2 hours, mean, 1 hour 30 minutes; afternoon period, 4½ hours to 7 hours, mean, 5 hours 30 minutes; stopping time, 6 p.m. to 8 p.m., mean, 6.45 p.m.; number of hours worked per day, 10 hours to 12 hours, mean, 10 hours 45 minutes.

Night shift:—Starting time, 6 p.m. to 8 p.m., mean, 7.10 p.m.; supper time, usually 1 hour, about midnight; stopping time, 5 a.m. to 7 a.m., mean, 6.15 a.m.; number of hours worked per night, 9½ hours to 11 hours, mean, 10 hours 10 minutes.

Three shift system.—4 a.m. to 12 noon, or 6 a.m. to 2 p.m.; 1 p.m. to 9 p.m., or 2 p.m. to 10 p.m.; 8.45 p.m. to 4.15 a.m., or 10 p.m. to 6 a.m.

Two shifts.—Shifts change over each per fortnight with 24 hours off.

Three shifts.—In some cases the shifts do not change over; in others they change each fortnight, with 24 hours off. There are no breaks for meals on the three-shift system, but in some cases light refreshment is taken whilst work proceeds.

We commend the above details to employers of labor on munition work; there is much in the report of value and interest.*

WOMEN OPERATORS MACHINING SMALL SHELLS IN ONE OF BRITAIN'S NEW PROJECTILE-MAKING PLANTS.

*Note.—Copies of the Report of the Mission will be sent post free on receipt of stamps to the value of 10 cents.

Scrap silver should be carefully sorted before undergoing the process of remelting and, if possible, all foreign substances should be removed. It may, if preferred, be melted into a separate bar, or otherwise used as an addition to a new mixture. As a flux for brittle and troublesome alloys, one authority states that a flux of charcoal with a small proportion of borax is extremely useful.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors.
A. G. WEBSTER. J. M. WILSON. J. H. RODGERS.
H. C. FOGARTY.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. MARCH 16, 1916 No. 11

18-PDR. H.E. SHELL OUTPUT IN AUSTRALIA

SOME interesting information has just come to hand relative to shell manufacture in our sister colony, Australia. Much prominence has been given to her shell output achievement—a prominence no less than that of presentation of the data connected therewith before several sittings of Canada's Federal House of Commons at Ottawa, and so staged as to reflect somewhat unfavorably on the shell production of our own metal-working plants. Distance may have lent enchantment to the view of Australia's sponsors on Parliament Hill; on the other hand it has undoubtedly provided opportunity for much exaggeration and much wild imagining, to express ourselves mildly.

Broadly speaking, and by virtue of our intimacy with shell manufacture in Canada since its inception, we are perhaps more familiar than most with what has been actually achieved by our metal-working plants. In addition, it is on record that the editorial columns of this journal furnished the first reliable data on the manufacture of high explosive shells to Australia. One of our special Shell Numbers—July 1, 1915, was reprinted in booklet form in toto, together with the accompanying illustrations, by the Australian Commonwealth Munitions Committee, Melbourne, for the information of Australian manufacturers of munitions. Sufficient evidence is therefore at hand to show that the odious comparison set up and sought to be drawn between the two Colonies was ill-conceived.

Shell manufacture in Canada has not by any means progressed by leaps and bounds, neither have its many activities been characterized by smoothness of operation. The desired end has not in every instance been satisfactorily attained. Taking it all-in-all, however, and even at its lowest value—"blundering through" if you will, our record is no mean one, and perhaps may look even less mean when the following statement from our Australian contemporary—"Australasian Engineering and Machinery" has been read and digested:

"The situation regarding shell manufacture in Australia is far from satisfactory. It is no fault of those who undertook to make the cases that their efforts have resulted in a pile of provisional rejects, with deliveries practically nil.

"A great fuss was made at the beginning, and for that matter is still being made, about what the Federal Government was going to do. We are repeatedly assured that all is going on favorably, a piece of bluff that ought to be dropped. It is time that departmental tardiness and blundering in this matter received an exposure. The latest ridiculous decision is to increase the diameter of the bar with the strange notion that the extra metal will eliminate microscopic flaws, due to faults in manufacture. The price of the shells has been fixed and contracts taken on the original diameter. Who is going to recoup the manufacturers for the extra work involved in removing this superfluous stock?

"The irony of it all lies in the praise of Australia's handling of the shell business by a member of the Canadian Parliament, who was out to criticize his own country's efforts, and of the Commonwealth Minister for Defence complacently quoting this uninformed comparison in reply to his critics. All who know anything of the facts—and Senator Pearce should be among them—know that in the production of munitions Canada has shown a promptitude and a power of organization which leaves every other British community hopelessly behind. From her hastily-adapted shops she landed satisfactorily shell cases in Great Britain even before the private factories of that country got going on munitions, and by now she has delivered them to the tune of many thousands of pounds. The Toronto correspondent of a daily paper sums up the position thus:—'Shell orders which have been filled or which are being filled in Canada, have reached the tremendous total of $500,000,000. More than 300 manufacturing firms are engaged upon the work in one way or another. These firms have installed $30,000,000 worth of special machinery, and employ 100,000 skilled workers.'

"Not a single shell has yet gone from Australia. These newspaper complaints are useless. The shell contractors should discuss the difficulties among themselves and make united representations to the Minister and the War Committee."

OUTPUT OF MUNITIONS IN FRANCE

ATTENTION is directed to an article under the above title appearing on the opposite page covering the output of war material in France. Out of the mass of detail given, the first impression to be formed is that of the terrible earnestness of the French nation in this war struggle, and as a result, the refutation of the often expressed belief that our Ally will waver in her determination and seek a separate peace. In spite of the fact that one-eighth of the country and five-eighths of its former metallurgical productivity are in the hands of the enemy, the production of munitions has increased enormously and continues to develop in that direction.

Through the medium of a British Mission of Investigation, the information has become available, and while it is possible that as regards spectacular achievement, the sons of France in the trenches may, while the war lasts, claim pride of place, in the final balance, her sons and daughters at work in her factories may just tilt the scale.

Copies of the Report will, we understand, be sent post free by the British Ministry of Munitions, London, England, on receipt of 10 cents in English currency.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	

	Montreal.	Toronto.
Middlesboro, No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	2.75
Steel bars, 2 in. and larger, base	4.00
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	3.00
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	2.90
Structural shapes	2.90
Plates	3.15

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$31 00	$30 50
Electrolytic copper	31 00	30 50
Castings, copper	30 00	30 00
Tin	50 00	56 00
Spelter	23 00	21 00
Lead	8 75	9 00
Antimony	48 00	48 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in., lb.	$3 40	$3 40
Heads, per 100 lb.	3 65	3 65
Tank plates, 3-16 in.	3 70	3 70

WROUGHT IRON PIPE

Prices in effect March 4, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 3 75
1/4 and 3/8 in.	2 76	4 59
1/2 in.	3 49	5 40
3/4 in.	4 14	6 73
1 in.	6 12	9 95
1 1/4 in.	8 28	13 46
1 1/2 in.	9 90	16 09
2 in.	13 32	21 65
2 1/2 in.	21 06	34 22
3 in.	27 54	44 75
3 1/2 in.	33 12	53 82
4 in.	39 24	63 77

Lapweld

	Black	Galv.
2 in.	14 80	23 13
2 1/2 in.	21 65	34 81
3 in.	28 31	45 52
3 1/2 in.	34 04	54 74
4 in.	40 33	64 86
4 1/2 in.	50 80	79 38
5 in.	59 20	92 50
6 in.	76 80	120 00
7 in.	104 72	160 65
8 in. x 25 lbs. per ft.	110 00	168 75
8 in. x 28 lbs. per ft.	126 72	194 40
9 in.	151 80	232 88
10 in. x 32 lbs. per ft.	140 80	216 00
10 in. x 40 lbs. per ft.	181 28	278 10

Ontario list—All points from Kingston and west to, but not including Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 3 75
1/4 in. and 3/8 in.	2 70	4 53
1/2 in.	3 40	5 31
3/4 in.	4 03	6 61
1 in.	5 95	9 78
1 1/4 in.	8 05	13 23
1 1/2 in.	9 63	15 81
2 in.	12 95	21 28
2 1/2 in.	20 48	33 64
3 in.	26 78	43 99
3 1/2 in.	32 20	52 90
4 in.	38 15	62 68

Lapweld

	Black	Galv.
2 in.	14 43	22 76
2 1/2 in.	21 06	34 22
3 in.	27 54	44 75
3 1/2 in.	33 12	53 82
4 in.	39 24	63 77
4 1/2 in.	49 53	78 11
5 in.	57 72	91 02
6 in.	74 88	118 08
7 in.	102 34	158 27
8 in. x 25 lbs. per ft.	107 50	166 25
8 in. x 28 lbs. per ft.	123 84	191 52
9 in.	148 35	229 43
10 in. x 32 lbs. per ft.	137 60	212 80
10 in. x 40 lbs. per ft.	177 16	273 98

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 75	$17 75
Copper, crucible	21 00	21 00
Copper, unch-bled, heavy	20 75	20 75
Copper wire, unch-bled	20 75	20 75
No. 1 machine compos'n	16 25	16 25
No. 1 compos'n turnings	14 50	13 50
New brass clippings	15 50	13 50
No. 1 brass turnings	11 25	11 25
Heavy melting steel	9 00	10 00
Boiler plate	11.75	19.00
Axles, steel	13.00	15.00
Axles, wrought iron	18.00	19.00
Tires, steel	11.75	10.50
Rails	14 00	13 00
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	9 50	9 00
Stove plate	9 50	8 50
No. 1 wrought iron	13 75	11 00
No. 1 machin'y cast iron	14 75	14 00
Heavy lead	6 50	6 25
Tea lead	5 50	5 25
Scrap zinc	15 50	15 50
Aluminum	34 00	34 50

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	60
Stove bolts	72 1/2
Plate washers	35
Machine bolts, 3/8 and less	52 1/2
Machine bolts, 7-16 and over	42 1/2
Blank bolts	42 1/2
Bolt ends	42 1/2
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hexagon, all sizes	2 3/4c per lb. off
Nuts, hexagon, all sizes	3c per lb. off
Copper rivets and burrs, list plus	15
Burrs only, list plus	30
Iron rivets	55
Boiler rivets, base, 3/4-in. and larger	$4.35
Structural rivets, as above	4.10
Wood screws, flathead, bright	80 & 10
Wood screws, flathead, brass	50
Wood screws, flathead, bronze	40

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$40 00
Open-hearth billets, Pittsburgh	40 00
Forging billets, Pittsburgh	60 00
Wire rods, Pittsburgh	55 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 45	$3 40
Cut nails	3 15	3 20
Miscellaneous wire nails	75 per cent.	
Pressed spikes, 5/8 diam., 100 lbs.	$3 75	

MISCELLANEOUS

Solder, guaranteed	0.31½
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.49
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	11.70
Red dry lead, 100-lb. kegs, per cwt.	11.50
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.78
Linseed oil, raw, single bbls.	1.02
Linseed oil, boiled, single bbls.	1.05
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	6.00
Lead wool, per lb.	0.12
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto	25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	55
Standard drills over 1½ in.	30
3-fluted drills to 1½ in.	30
3-fluted drills over 1½ in.	20
Bit stock	65
Ratchet drills	30
Machine bits for wood	30 and 5
S.S. drills for wood	55
Wood boring brace drills	40
Electricians	35
Sockets	55
Sleeves	55
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	10
Drills and countersinks	5
Bridge reamers	55
Centre reamers	15
Chucking reamers	15
Hand reamers	15 and 5

High speed drills and reamers are double the list price plus 20 per cent.

COLD ROLLED SHAFTING

At mill	10%
At warehouse	Net

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 72½; malleable, lipped unions, 65.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$3 75
Sheets, black, No. 10	3 80	3 80
Canada plates, dull, 52 sheets	4 50	4 00
Canada Plates, all bright	6 30	5 50
Apollo brand, 10¾ oz. galvanized	6 75	6 75
Queen's Head, 28 B.W.G.	7 25	7 25
Fleur-de-Lis, 28 B.W.G.	7 00	7 00
Gorbal's Best, No. 28	7 25	7 25
Viking metal, No. 28	7 00	7 00
Colborne Crown, No. 28	6 75	6 75
Premier, No. 28, U.S.	6 65	6 65
Premier, 10¾ oz.	6 90	6 90

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.35
3/8 in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
5/8 in.	6.35
¾ in.	6.15
7/8 in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B.B

1/8 in.	$14.00
3-16 in.	10.45
¼ in.	7.15
5-16 in.	5.65
3/8 in.	4.60
7-16 in.	4.60
½ in.	4.60
5/8 in.	4.45
¾ in.	4.45

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	72½
Kearney & Foot, Arcade	72½
J. Barton Smith, Eagle	72½
McClelland, Globe	72½
BlackDiamond	60-7½
Delta Files	72½
Nicholson	72½
Globe	72½
Vulcan	70-10
Disston	70

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$18 70	......
1¼ in.	18 70	......
1½ in.	18 70	12 70
1¾ in.	22 00	12 70
2 in.	22 00	12 10
2¼ in.	24 20	13 30
2½ in.	26 40	15 95
3 in.	35 20	16 06
3½ in.	40 00	19 80
4 in.	45 00	25 30

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.23
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	.04¾
Lard oil, per gal.	1.28
Thread cutting oil	.54
Imperial quenching oil	.38
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, 3/8 in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, 3/8 in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.15¼
Peerless	.15¼
Grand	.14¼
X L C R	.13¼
Atlas	.13¼
X Empire	.12¼
X press	.11¼
COLORED.	
Lion	.09½
Standard	.08¾
No. 1	.08¾
Popular	.07¾
Keen	.06¾
WOOL PACKING.	
Arrow	.20
Axle	.15
Anvil	.11
Anchor	.09
WASHED WIPERS.	
Select White	.09
Mixed Colored	.07
Dark Colored	.06

This list subject to trade discount for quantity.

COPPER SHEETS

	Montreal	Toronto
Bars, ½ to 2 in.	$41.00	$41.00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 in.	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$11 50	$11 50
Sheets, 3½ lbs. sq. ft.	10 30	11 25
Sheets, 4 to 6 lbs. sq. ft.	10 75	11 00

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.32 to .33
Tin	.48 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs, American	.03 to .04
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy	.35
Copper sulphate	.25
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., March 14, 1916.—Abnormal conditions continue to prevail throughout all branches of the steel and metal-working industries. Present indications point to still higher levels being attained by the present upward movement. Domestic construction does not seem likely to be proceeded with to any great extent this year unless circumstances warrant. Several plants are changing over to larger sizes of shells on completing their 18-pdr. contracts, additional area being necessary in some cases. The ocean freight situation remains unchanged, the cost of material and scarcity of suitable labor making remote any prospect of relief from new construction in this country.

Pig Iron

The pig iron situation is unchanged and quotations are firm, with a possibility of an advance in the near future. The demand for steel making pig continues, and production is being taxed to the utmost to meet requirements. A sharp advance is noted in ferromanganese, the price having advanced $100 on prompt and $25 on contract order.

Steel

No recent developments have transpired to change the general conditions. The unceasing demand for steel continues to advance prices in many lines. The shipping problem has been somewhat relieved recently by the raising of embargoes. Local dealers report no change in quotations, but intimate that further advances of American markets will likely effect prices here. Bessemer billets are quoted at $40, an advance of $2 per ton. Open-hearth billets and sheet bars are quoted at $44, an advance of $4 a ton; these prices are f.o.b., makers' mill, Pittsburg.

Forging billets, Pittsburg, show an increase of $5 a ton, and are quoted on the New York market at $65 a ton. Iron bars, Chicago, have been advanced $3 a ton, and Pittsburg steel bars are higher by $5 a ton. Steel mills are so heavily sold that early requirements can only be taken on at very high prices. Even at the advancing prices orders are flowing in for future delivery. The market in sheets is taking on strength, and prices are again going up. The demand for blue annealed sheets is increasing, and to some extent the output of black sheets is being curtailed. The automobile requirements are also crowding the sheet mills, and producers have been forced to add an average of $3 a ton to sheet prices. Chicago quotations on black sheets are $3.39; blue annealed, Pittsburg, $3.00. The weakness of spelter, with the light demand for galvanized sheets, has considerably relieved the price on galvanized sheets, which are lower by $2 a ton. Terne plate, I.C., Pittsburg, shows a decline of $5 a ton, present quotation being $3.75 per hundred. Considerable business is reported in fabricated steel.

Metals

Several changes have developed in the metal situation during the past week, but it is not thought that conditions will be materially affected, as nothing has transpire to indicate any great change in either direction. The American copper market shows slight signs of relaxation, but this is apparently due to the fact that many of the large consumers have covered their requirements for several months in advance. For a certain period dullness may prevail, but with the producers being in a position where they are required to deliver their entire output, it is unlikely that a supply of stock material can be accumulated, and this will prevent any noticeable decline from the present high prices. The shortage of nearby tin has developed a strong market, and the tendency is for higher prices. Spelter is dull, but showing signs of improvement. Lead is erratic and taking on strength, forcing prices up. The raising of embargoes on some of the Eastern roads will somewhat relieve the situation by permitting shipments of metals from points of production to destination.

Copper.—The advance recently quoted on the London market of £5 per ton has had no strengthening effect upon the local or New York situation; in fact, the condition prevailing at present is somewhat easier, with an appreciable drop in current prices on the New York market; lake showing a falling off of .375 cents and electrolytic .625 cents per pound. The recent action of the British Government in prohibiting the transactions in future delivery of war metals—which

had the effect of closing the London Metal Exchange from March 1 to 4—has not resulted in any noticeable development. Certain new regulations are believed to involve a maximum price, but, despite this ruling, the quotation on electrolytic continues to remain at £136. It is the opinion of the trade that Britain will be forced to pay the price that the war conditions will impose on all purchasers of copper. Local conditions remain unchanged with prices firm, but dealers report that further declines on the American markets would ultimately weaken the market here, and tend to lower prices. Lake and electrolytic are steady at 31 cents, and castings unchanged at 30 cents per pound.

Tin.—The market is considerably excited over the apparent shortage of available tin, and unless the market is advised of considerable shipment en route from London, the outlook for the remainder of the month may develop into a serious situation. The British Government is continuing very firm in its regulations regarding shipping permits of tin, either from London or the Straits Settlements, and buyers are becoming very anxious. The temptation to resell metal is very strong, but consumers are holding firm to their agreement not to dispose of any of their supply after it has been released to them through the British Consul. Any confirmation of consumers profiting through this method would prevent them securing further supply, and it is believed that no case has yet been recorded of a resale since the order was first established. Purchases are recorded for last quarter delivery 41 and 42 cents New York. The local market is very strong, and dealers report good business, but available supply appears short. This week's quotation, 50 cents, shows an advance of 2 cents per pound.

Spelter.—The situation in spelter here remains unchanged. The New York market shows a decline of 1½ cents ,and the London cables report a drop of £8 per ton. The demand for spelter, however, continues to improve, and it is possible that the market will assume a firmer tone within a short time. Montreal dealers are holding firm, and quotations are unchanged at 23 cents per pound.

Lead.—The market is very strong and prices continue to advance. Trust prices have advanced 20 cents per hundred, while outside quotations show an increase of ½c per pound. Foreign advances have had the effect of strengthening the market here, and dealers have advanced their quotation to 8¾ cents, being a rise of ½ cent per pound.

Antimony.—No change is reported in the situation, and dealers are asking last week's price, 48 cents per pound.

Aluminum.—The market is unchanged, and quotations are firm at 68 cents.

Machine Tools and Supplies

The market for machine tools continues fairly active, the principal business being in the changing of equipment necessitated by the falling off of the smaller shell requirements. In some instances almost the entire equipment is being replaced by heavier tools in order to successfully handle the larger shells. The domestic demand is improving, but the greater percentage of present business can be traced, directly or indirectly, to the abnormal conditions of the war situation. The demand for all kinds of supplies continues, and in many cases the inability to obtain sufficient material and small tool supplies results in serious delay in production. The steady advance in prices of all grades of steel has materially affected many accessories of machine tools, and prices of drills, taps, reamers, cutters, etc., have been constantly advancing.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Old Materials

Dealers report considerable activity in many lines of scrap. Heavy melting steel is in good demand, with prices firm. All old steel is moving readily, and prices have advanced on rails and shafting 1 cent and 2 cents respectively, and are now selling at 14 cents a pound for old rails and 17 cents for old shafting. No. 1 composition turnings are now 14½ cents, and new brass clippings are bringing 15½ cents a pound, being an increase of 1 cent a pound. Old lead is up ½ cent, heavy quoted at 6½ cents and tea lead 5½ cents a pound. All coppers are in good demand, and prices are very firm.

Toronto, Ont., March 14.—The steady advance in prices of raw materials has been for some time, and will continue to be a matter of vital importance to manufacturers. The difficulty in obtaining raw materials is causing considerable anxiety and threatens to curtail production, not so much for war supplies as for goods for domestic consumption. The difficulty of obtaining iron and steel except on late deliveries is the principal cause, and the situation is becoming more acute as time passes. Shortage of tonnage and high freight rates is also increasing the cost of some materials and causing considerable delay to shipments. Cost of production is going up, and consequently all prices have an upward tendency. There are not many price changes to announce this week, but the market is very firm and indications point to higher levels for many products in the near future. The changes include higher prices for wrought iron and galvanized pipe, wood screws, wrought iron nipples, "Trimo" tools, gasoline, benzine, tin and lead.

Industrial conditions continue to steadily improve, and a large number of manufacturing and industrial plants are engaged in making ammunition and other war supples. The prevailing prosperity in the country is due largely to war orders, although domestic business is showing signs of a revival. The Dominion revenues continue to increase, which is a very satisfactory feature. The total revenue for the last eleven months of the fiscal year was over 134 million dollars, being an increase of 34 millions over the corresponding period of the last fiscal year.

Steel Market

The mills continue to receive orders for steel in large volume and deliveries are getting more behind than ever. The situation is becoming serious, as the steel companies anticipate some difficulty in filling orders for all the steel required for munition purposes. An enormous quantity of shells will be turned out this year, which will require a large tonnage of steel. In addition to this, there is a very large and profitable export business to take care of. The Canadian Steel Foundries have resumed operations at their Welland plant with their 12 in. rolling mill, and the 22-in. mill will be running very shortly.

The market continues very strong, and quotations have an upward tendency. Makers of wrought iron pipe have again raised their prices on both black and galvanized. Black pipe has advanced two points and galvanized three points. Boiler tubes are unchanged, but the mills report a heavy demand for locomotive and merchant tubes. Prices of shafting have advanced $5 a ton in the States, but are unchanged locally. The new demand for shafting is reported to be heavy, and none of the makers has any to sell for delivery inside of six or eight months. Boiler and tank plates are unchanged, but higher prices are anticipated. A sharp advance of 25c in wire nails took place during the week. Wire nails are now quoted at $3.50 per keg base, with cut nails unchanged at $3.20 per keg base. Smooth steel wire advanced 15c, and is now quoted at $3.60 base per 100 pounds, No. 0 to 9 gauge.

Prices of iron and steel bars are very firm at $2.75 per 100 lbs. base.

The sheet market has strengthened in the past few days, and quotations are firm, but unchanged. The sheet mills in the States have advanced prices, which will in due course affect the local market. The galvanized sheet market is strong and prices unchanged. The weakness in spelter has affected the sheet market, and makers are waiting until the spelter market assumes a definite course.

The tremendous pressure on the mills in the United States continues, and, despite the heaviest outputs recorded, they are getting further back on deliveries. The U. S. Steel Corporation, on Feb. 29, had unfilled orders on its books, amounting to 8,568,966 tons, compared with 7,922,767 tons on January 31. Steel bars are unchanged at 2.50c, iron bars 2,35c, plates 2.75c, and shapes 2.25c, Pittsburg. Billets have advanced due to the shortage of supply, and are quoted as follows at Pittsburgh: Bessemer and open-hearth billets $40, and forging billets $60 per ton. Wire rods have advanced $5, and are now quoted at $55 per ton Pittsburgh. Mills delivering rods to Canada have to declare their market value, which has lately been $50, but this will probably soon be raised to $55. Deliveries on wire rods are very backward, running into the second half. Chicago warehouse prices are unchanged, but firm.

Pig Iron

Quotations are unchanged, and the situation in the market is much the same as last week. As the steel companies make their own pig iron, the market has not been affected much by the heavy demand for steel. A revival in the foundry business would have a beneficial effect on the pig iron market.

The total production of pig iron in Canadian blast furnaces in 1915 was 913, 719 short tons valued at approximately $11,592,819. The production in 1914 was 783,164 tons, and valued at about $10,-002,856. A large proportion of the production in 1915 was used in the manufacture of steel for munition purposes. The production this year will no doubt exceed last year's tonnage, as the steel mills are more active owing to a greatly increased demand for steel products.

Old Materials

The market is weaker and depressed with quotations practically unchanged. Ordinary business is very quiet, the demand being almost entirely in connection with munitions. Heavy melting steel is quiet, but in good demand. The embargo on the export of wrought iron and steel scrap is depressing this market. Copper and lead are firm, particularly the latter, although there has been no change in quotations. Aluminum is very scarce and prices are firm.

Machine Tools

The market has been more active this week, and quite a number of inquiries have been received by local machinery houses for tools for machining 4.5 in. and 6 in. shells. Orders keep coming along for single tools for shell plants, and there will no doubt be steady business of this nature throughout the year. Representatives of the Gray-Dort Motor Co. have been in town buying equipment for their new plant at Chatham, Ont. It is reported that the Canadian Hoskins Co., of Walkerville, Ont., are in the market for various kinds of wire drawing machinery.

Supplies

Business continues good, and prices are still advancing. "Trimo" wrenches are higher, the new discount being 62½ per cent., as against 65 per cent. formerly. New and lower discounts on wood screws have been issued, representing an advance of 20 per cent. There is a big demand for certain sizes of wood screws for ammunition boxes. The expected advance in gasoline and benzine has been made. Gasoline is now quoted at 32c per gallon and benzine ½c less. Another advance may be looked for in the near future. Wrought nipples have advanced, the new discount being 72½ per cent.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attaché, Room 904 Flat Iron Building, New York City.

Metals

The chief item of importance this week is a sharp advance in the tin market and the steady upward movement in lead. The strength of the tin market is due to a scarcity of spot metal, but quotations are purely nominal. The lead market is strong, with outside quotations higher than the "Trust" price. There is a heavy demand for lead, and a scarcity has developed. The copper market is firm, but quiet, the demand for this metal having fallen off temporarily. The spelter market is weak and lower, there being little buying to speak of. The spelter market declined in London as well as New York. The antimony market is quiet, but firm, with the situation unchanged. The aluminum market is dull and weaker.

Copper.—Prices of copper are entirely nominal for all deliveries and the market is dull. The situation, however, is unchanged, and the quietness is due to an absence of business, consumers being well covered meantime. The producers have control of the market. There is no sign of weakness in the situation, and there appears to be little possibility of prices being depressed materially. Local quotations are unchanged and nominal at 30½c per pound.

Tin.—Quotations have advanced sharply on account of a scarcity of spot metal and the market is strong. The tight situation in New York has been caused by consumers not being able to sell owing to restrictions applied by the British Government. Consumers under the British restrictions cannot carry heavy stocks or re-sell the tin, and the spot situation is liable to be affected any time on account of these restrictions. Tin has advanced to 6c, and is purely nominal at 56c per pound.

Spelter.—The market is weak and the decline continues. Buyers, however, are showing more interest than for some time, and this has given the market a better tone, despite the lower prices. Spelter has declined 2c, and is quoted at 21c per pound.

Lead.—The market is strong and higher, due to the heavy demand and acute scarcity of supplies, notwithstanding the fact that the production is the highest ever known. The "Trust" has advanced the price of lead to 6.60c New York, but outside quotations are even higher, ranging from 6¾c to 7c New York. Lead has advanced ½c locally, and is quoted at 9c per pound.

Antimony.—The buying movement appears to have stopped, and consumers are well covered in the meantime. The situation is unchanged, and quotations nominal at 48c per pound.

Aluminum.—The market is a little easier owing to freer offerings of metal. Quotations, however, are unchanged at 68c per pound.

U. S. SULPHURIC ACID EXPORTS

EXPORTS of sulphuric acid from the United States in October, 1915, the latest published data, were 8,561,147 lb., making the total 71,997,192 lb. to Nov. 1, 1915, the largest on record both for a month for ten months. The total to Nov. 1, 1914, and 1913, was 8,068,743 lb. and 7,202,110 lb. respectively. For the fiscal year of 1910 the total exports were

only 5,081,038 lb. and in that of 1914 they were 12,131,750 lb.

Before the war, 60 deg. sulphuric acid sold at about \$10.50 to \$11 per ton in tank car lots, with \$12 to \$13 obtained for 66 deg. acid. While as high as \$110 is said to have been received for tank car lots, some makers are now selling regularly at \$40 to \$45 for 60 deg. acid in tank car lots. Another producer is understood to be obtaining \$75 per ton in tank car lots and \$80 per ton for acid in carboys for 66 deg. acid. Commercial acid obtained as a by-product in zinc smelting is reported to be sold at \$24 to \$30 per ton.

ZINC SOURCES WITHIN BRITISH EMPIRE

THE large amount of zinc required for war purposes, and the resulting enormously increased demand for the metal known commercially as spelter, lend special interest to an article in the current number of the "Bulletin of the Imperial Institute" on "The Occurrence and Utilization of Zinc Ores." The chief zinc minerals are described, and a brief account given of the more important occurrences in the United Kingdom, the colonies and India.

Zinc ores have been mined in many parts of the United Kingdom, notably in Cumberland, Northumberland, Durham, Derbyshire, Shropshire and the Isle of Man, but a large proportion of the production has for several years past been shipped to the Continent for smelting. By far the most important zinc deposits in the British Empire are those of Broken Hill Mines, New South Wales, the output of which alone is sufficient to supply the entire demands of the United Kingdom for metallic zinc. The Broken Hill ore before the war went mainly to Germany for smelting, but the Australian Government has adopted measures which will prevent this in the future. Zinc is also found in South Australia, Queensland, Tasmania, New Zealand and Newfoundland. Canada contains a number of workable zinc deposits, particularly in British Columbia, and there is every prospect of Burma becoming an important producer. In Africa there are zinc deposits in Egypt, Nigeria, Rhodesia and the Transvaal, as to which more information is needed.

Stratford, Ont.—The Public Utilities Commission have decided to purchase three transformers with a capacity of 900 K.W. The cost will be about \$6,000.

Ottawa, Ont. — Tenders will be received by the Board of Control, up to Tuesday, March 28, for two motor driven street flushers. Specifications may be obtained on application to the city engineer's office, City Hall, F. C. Askwith, acting city engineer.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Joliette, Que. — The Joliette Steel Co., are making extensions to their plant.

Three Rivers, Que. — The Canadian Iron Corporation will build an addition to its plant.

London, Ont.—The London Foundry Co., contemplate making an extension to their plant.

Drummondville, Que. — The Aetna Chemical Co., will build an acid plant at a cost of $300,000.

Owen Sound, Ont. — The Durham Cement Co., will make extensive alterations to their plant. Hydro power will be installed.

Drummondville, Que. — Walter A. Moisan, town clerk, is calling bids for the construction of a pumping station and mechanical gravity filters.

Trenton, Ont. — The Ireland McCall machine shop, and the garage owned by Graydon & Clegg at this place have been totally destroyed by fire with a loss of $10,000.

Brandon, Man.—The city council have granted the Continental Oil Co., permission to build two large storage tanks on the C. N. R. The tanks will hold 24,000 gallons and the company intends to make this their distributing point for the large area of Western Manitoba and Eastern Saskatchewan.

Walkerville, Ont. —. The Canadian Hoskins, Ltd., is in the market for machinery for the manufacture of wire goods to cost about $10,000. R. H. Cunningham is manager.

Welland, Ont. — The Canadian Steel Foundries Ltd., have started operations at their plant here. The 12 in. mill is now in operation and the 22 in. mill will be started very shortly.

Granby, Que.—The F. S. Carr Rubber Co. has taken over the old factory of the Walpole Rubber Co. here, and is installing a complete power system, including steam boilers, engines, generators, etc.

Toronto, Ont.—Kerry & Chace, Ltd., 550 Confederation Life Building, are in the market for the following machinery: One alternating-current generator, 300 to 600 kv., sixty-cycle, three-phase, 6600 volts; two belted induction or synchronous motors, 300 to 400 hp., sixty-cycle, three-phase, 6600 volts; two belt-driven air compressors of 2000-cu ft. capacity each, to give 100-lb. pressure, etc., to be delivered to Cardova Mines, Ont.

Sarnia, Ont.—The Imperial Oil Co., which a short time ago increased its capital from $15,000,000 to $50,000,000, will construct a big addition to its plant here this summer. The plant affected is the motor spirit department, which is known as No. 2 plant. More stills and tanks will be added to increase the output. The company has on hand 6,000 tons of steel for the new structure building here and at other points, and this will be manufactured here. Plants will be built in Montreal this summer and at Regina.

Municipal

Emerson, Man. — The Town Council contemplate the installation of an electric light plant.

Campbellton, N.B.—The Town Council will probably spend $5,000 on a street lighting system.

Chatham, Ont.—The ratepayers have voted in favor of a by-law to assist the Chatham Shoe Co. who propose locating here.

St. Marys, Ont. — Blanchard Township, one of the few municipalities that defeated the London-Toronto Hydro radial proposition in January last, indorsed it last Monday, the ratepayers carrying it at the polls by a majority of 23.

EQUIPMENT FOR AUSTRALIAN NAVAL DOCKYARD

Tender forms and specifications have been forwarded by D. H. Ross, Trade Commissioner, Melbourne, for 43 machines of various types required for the equipment of the Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W. Tenders will be received, subject to the conditions specified, up to May 1, 1916, addressed to the Director of Navy Contracts, Melbourne, Australia. The last mail in time to reach Melbourne on May 1 is that leaving San Francisco on March 22 and due at Melbourne on April 12. The tender forms are open to the inspection of Canadian manufacturers at the Department of Trade and Commerce, Ottawa (refer file No. A-1435). Particulars of the requirements are briefly outlined thus:

Three 50-ton overhead travelling cranes.

One 25-ton overhead travelling crane.

Two 5-ton overhead travelling cranes.

One 10-ton revolving cantilever crane.

Two 5-ton travelling portal jib cranes.

Two 7½-ton jib cranes.

One 5-ton jib crane.

Two 15-ton hydraulic cranes.

One 6-ton hydraulic crane.

One 6-ton wall crane (hydraulic).

Two 3-ton wall cranes (hydraulic).

Two electric passenger elevators.

Two electric goods elevators.

One 2½-ton gauge locomotive with crane attached.

One 2½-ton gauge locomotive without crane attached.

Three electrically-driven air compressors, 1,500 cu. ft.

One 15-ton hydraulic winch.

One 5-ton hydraulic winch.

Nine 10-ton hydraulic capstans.

Two 5-ton hydraulic capstans.

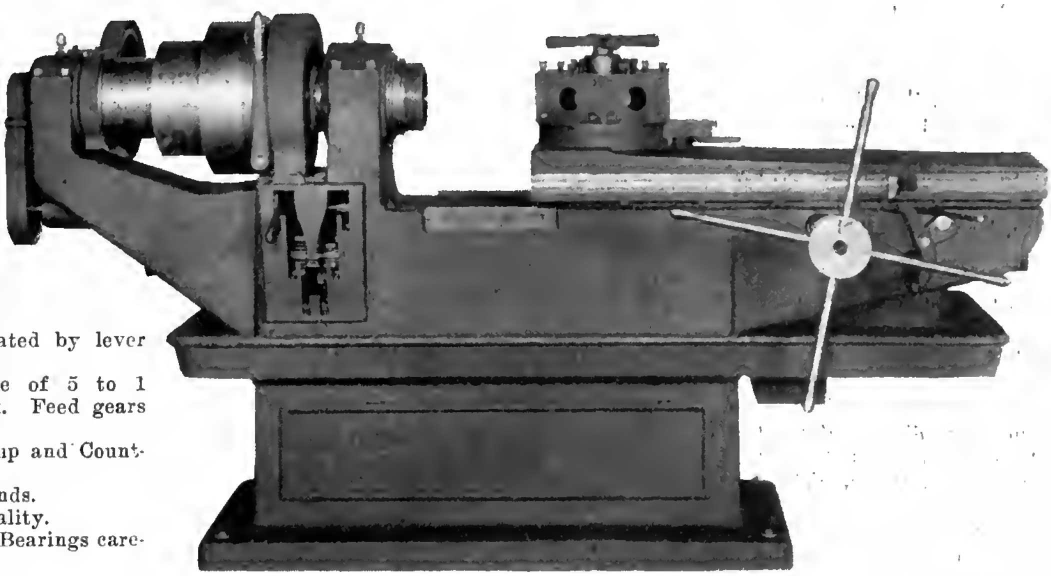
One bar shearing machine.

One double-ended horizontal punching machine.

One 10-ton overhead travelling crane for shipyard fitting shop.

GREENSBORO TURRET LATHE

For Boring and Recessing Base of 4.5 and 6" Shells



Spindle is made of Carbon Steel, 8" diam. in front bearing and bored 6¼" diam. 8" deep, so part of shell is held within bearing to prevent overhang.
Spindle runs in heavy bronze bearings.
Head has friction back gear, 5½" belt.
Turret is bored for 3" Bars, has power feed with automatic stop.
Quick-change feeds operated by lever under head.
Turnstile has a leverage of 5 to 1 though gearing into rack. Feed gears made of steel.
Equipment: Oil Pan, Pump and Countershaft.
Weight: About 6,000 pounds.
Workmanship of Best Quality.
All Spindles ground. All Bearings carefully scraped.

THE A. R. WILLIAMS MACHINERY CO., LIMITED
TORONTO **CANADA**

There is Absolute Satisfaction

In Geometric Self-opening and Adjustable Screw-cutting Die Heads.

We specialize on Threading Tools, and manufacture nothing else.

All our efforts are directed to building Screw-Cutting Tools a little better than anyone else builds them.

Take up your Threading proposition with us. Get acquainted with our products now. Order when you please.

The Geometric Tool Co.

New Haven, Conn.

Canadian Agents:
Williams & Wilson, Ltd., Montreal. The A. R. Williams Mchy. Co., Ltd., Toronto, Winnipeg, St. John, N. B.

Calgary, Alta. — The purchasing of new equipment needed at the city power house will be proceeded with immediately some contracts have already been awarded.

General Industrial

St. Jerome, Que.—The St. Jerome Mfg. Co., Ltd., will enlarge their factory. Tenders will be called shortly.

Calgary, Alta.—The west end incinerator was destroyed by fire on March 10. with a loss of $50,000.

Moose Jaw, Sask.—Fire caused damage to the extent of $50,000 to the Gordon Ironsides packing plant here on March 4.

Brantford, Ont. — Fire from an unknown cause did about $10,000 damage to the plant of B. Bell and Son, Co., at St. George, on March, 11.

St. John, N.B.—Fire on March 4, caused a loss estimated at $35,000 to $40,000, in the Prince William street building of Dearborn & Co., wholesale spice company.

Kincardine, Ont. — The Ontario People's Salt and Soda Co., contemplate making extensions to their plant J. R. Mckay has been appointed manager of the company in succession to the late John Tolmie.

Port Arthur, Ont.—It is reported that two new grain elevators will be built here during the coming season. One of them, for the Saskatchewan Co-operative Grain Association, will have a capacity of 2,500,000 bushels. The other will probably be built by the C.N. R.

Berlin, Ont.—Doon Twines of Doon, Ont., have closed negotiations for the purchase of the new plant erected last year by the Regal Auto Co. The Doon Co will take possession of a portion of the building almost immediately. The plant in Doon will be closed down owing to the difficulty experienced in securing necessary help. It is reported that the Regal Auto Co., will build another factory here.

Hamilton, Ont. — The Ontario Yarn Co. of Markham, Ont., will establish a branch factory here for making knitting and hosiery yarns. The old customs House has been rented for a term of years and $20,000 will be spent in equipment principally carding, spinning and winding machinery. J. A. Kammerer of Toronto is president of the company and A. M. Morrison of Markham is managing director.

Contracts Awarded

St. Thomas, Ont.—The Petrolia Bridge Co., of Petrolia, Ont., have been awarded the contract for a bridge at Wardsville to cost $4,100.

Montreal, Que.—The Board of Control has awarded the contract for the installation of a pump at Papineau Avenue pumping station to the Canadian Allis-Chalmers, Ltd.

Calgary, Alta. — The City Commissioners have awarded a contract to the Canadian Westinghouse Co., for electrical apparatus for the city power house at $9,770.

Sarnia, Ont.—The City Council has accepted the tenders of Mackenzie, Milne & Co., the H. Mueller Mfg. Co., and the National Iron Works for supplies for the waterworks.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

Ottawa, Ont.—The City Council have awarded the following contracts: Pipe. The National Ironworks Ltd., Toronto; valves, McDougalls Ltd., and General Supply Co., Ottawa; brass work, the General Supply Co.

New Incorporations

J. E. Edwards & Sons, Ltd., has been incorporated at Toronto with a capital of $50,000 to manufacture leather goods, harness, etc., at Toronto, Ont. Incorporators, L. A. Lillico, G. G. Beckett and J. G. Leckie all of Toronto.

Beemer & Co., has been incorporated at Toronto with a capital of $55,000 to manufacture automobiles, motors, engines, at London, Ont. Incorporators, J. C. Beemer, and F. D. McLachlin, or London, Ont.

Jacob Kaufman, Ltd., incorporated at Toronto, with a capital of $250,000, to carry on a wood-working business at Berlin, Ont. Provisional directors are: Jacob Kaufman and Milton R. Kaufman. of Berlin, Ont.

The Anglo-American Talc Corporation has been licensed at Toronto, with a capital, not exceeding $50,000, to acquire and develop lands and deposits. Thomas Carswell, of Madoc, Ont., is the attorney for the said company.

The Toronto Chemical Co. has been granted a provincial license at Toronto, to manufacture benzol and other hydrocarbons. The capital of the company is not to exceed $150,000, and their attorney is Leighton McCarthy, of Toronto

The Toronto Builders Supplies, Ltd., has been incorporated at Toronto with a capital of $50,000 to manufacture builders' supplies of all kinds. Head office to be at Toronto. Incorporators, G. McLaughlin, W. B. Milliken and F. Lane, all of Toronto.

The Dominion Dustless Sweepers, Ltd., has been incorporated at Ottawa, with a capital of $200,000 to manufacture street cleaning machinery. at Peterborough, Ont. Incorporators, W. H. Hamilton, W. M. Lang and W. H. Buller all of Peterborough, Ont.

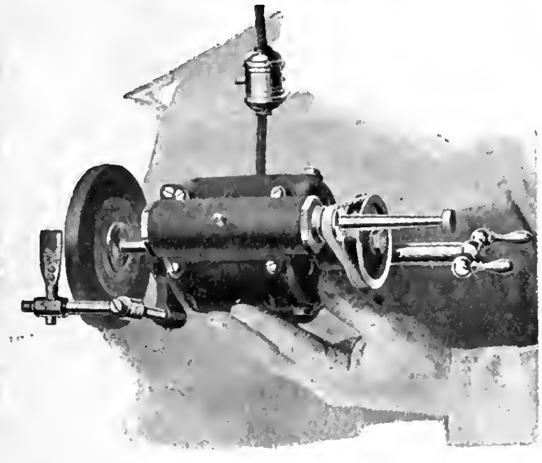
The John V. Gray Construction Co., has been incorporated at Toronto with a capital of $40,000 to carry on the business of general contractors. Head office to be situated at Toronto. Incorporators, J. V. Gray, J. C. McKay, MacBeth, and R. Wherry.

The Whitlock Printing Press Mfg. Co., has been granted a provincial license at Toronto to manufacture printing presses and similar machinery. Head office is at Toronto and the capital does not exceed $40,000. Frank W. Manton of Toronto is attorney.

The Hughes Electric Heating Co., has been granted a provincial license at Toronto to manufacture electric heaters and other electric appliances. The capital is not to exceed $50,000 and the head office is at Toronto. Frank M. Dusenbery of Toronto is attorney.

The Mattagami Pulp & Paper Co., has been incorporated at Toronto with a capital of $4,000,000 to manufacture pulpwood and all kinds of paper. Head office to be situated at Toronto, Ont. Incorporators, W. J. Boland, J. F. Boland and E. Knox all of Toronto.

Aikenhead's

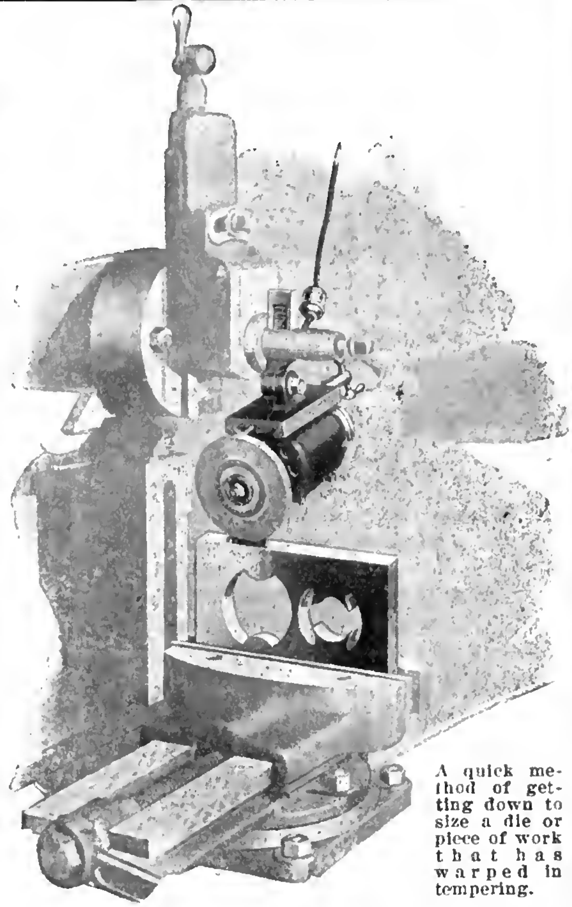


The DUMORE Portable Grinder. The only small grinder giving wheels the correct surface speed. Speed, 30,000 R.P.M.

Keeping a close tab on shop costs helps to pay dividends, and the

DUMORE

is a real efficiency expert. It does its work thoroughly and quickly, and adds greatly to the efficiency of your shop men. The **Dumore Grinder** fills a big need in every shop.



A quick method of getting down to size a die or piece of work that has warped in tempering.

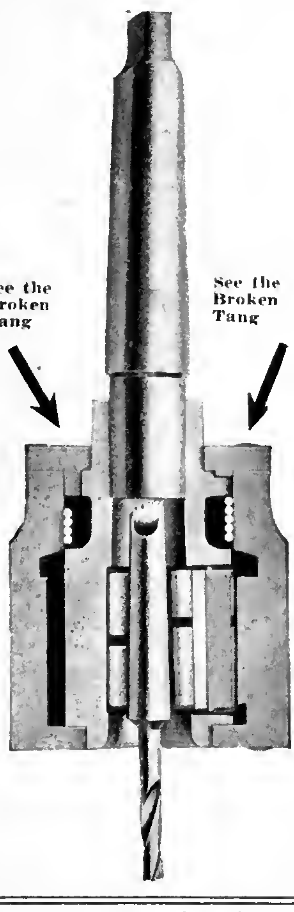
Aikenhead Hardware Limited

17, 19, 21 Temperance Street

TORONTO - - - CANADA

See the Broken Tang

See the Broken Tang



Don't Throw Away Broken Tang Drills

Perhaps you are about to discard some taper shank drills because the tangs are broken off —DON'T DO IT—they are worth their weight in gold. You can use them just as they are with a

Wahlstrom Automatic Chuck

One chuck holds drills from 1/16" to 1¼"

and you won't have to take time from your production to repair them.

Tool changes are made in two seconds—just grasp the shell of the chuck with one hand and put in or remove the tool with the other—no collets—no lost time, for the spindle never stops

The jaws grip NOT BY THE TANG, BUT ON THE SIDE OF THE TAPER—there's no chance for slippage—a Wahlstrom won't even mar the shanks.

CANADIAN DEALERS:

Aikenhead Hdw. Co., Toronto, Ont., Canada.

Williams & Wilson, Ltd., Montreal, Quebec, Canada.

Wahlstrom Tool Company

350 Carroll Street **Brooklyn, N.Y.**

The Standard Marble & Tile Co. has been incorporated at Ottawa, with a capital of $150,000, to quarry marble, stone, granite, etc. Head office to be situated at Toronto. Incorporators are: Frank C. Dunham, George R. Sproat, and Franklin M. McDowell, all of Toronto.

The Wilson Scale & Machinery Corporation, Ltd, has been incorporated at Toronto with a capital of $100,000 to manufacture, scales, tools, machinery implements, utensils, hardware, etc., at Toronto, Ont. Incorporators, J. T. Lauder, F. J. Norris and C. Stanley ali of Toronto

The National Woollwear Co. has been incorporated at Ottawa, with a capital of $45,000, to carry on the business of spinning, manufacturing wool, silk and cotton, woollen goods, at Hamilton. Incorporators: John R. Marshall, Stanley R. Jefferess and George A. Young, all of Hamilton.

The Overland Tire & Rubber Co., has been incorporated at Ottawa with a capital of $50,000 to carry on the business of manufacturers of rubber and rubber tires. Head office to be situated at Montreal. Incorporators, J. J. O'Reilly, N. F. MacNeill, and W. R. McKay all of Montreal.

The Burrows Refining Co., has been incorporated at Ottawa, with a capital of $1,500,000, to carry on the business of producing, reducing, and refining ores, metals, oils, etc. Head office to be situated at Ottawa. Incorporators. W. C. Perkins, and W. D. McCormick of Ottawa, Ont.

The Cornwall Pants Co., has been incorporated at Toronto with a capital of $25,000 to manufacture clothing, shirts, etc. Head office to be situated at Cornwall. Incorporators, J. D. Bissett, T. H. Peine and A. L. Williams, all of Toronto.

The Canadian Germicide Co., has been incorporated at Ottawa with a capital of $40,000 to manufacture germicides, disinfectants, antiseptics, etc. Head office to be situated at Toronto. Ont. Incorporators, D. I. Grant, M. MacDonald, and E. Smily, all of Toronto.

The Modern Heating and Engineering Co., has been incorporated at Ottawa with a capital of $49,000 to carry on the business of mechanical engineers, founders, smiths, etc. Head office to be situated at Montreal. Incorporators, J. E. Aron and J. U. Archambault, all of Hull.

The Powers Accounting Machine Co. of Canada, Ltd., has been incorporated at Ottawa with a capital of $25,000 to manufacture perforating, tabulating, adding, calculating machines, etc. Head office to be situated at Montreal. Incorporators, G. W. MacDougall, L. MacFarlane and W. B. Scott, all of MMontreal, Que.

The Stanley Steel Co., has been incorporated at Ottawa with a capital of $250,000 to carry on the business of iron and steel makers, smelters, engineers, sheet metal and rail rollers, etc. Head office to be situated at Hamilton, Ont. Incorporators, A. F. Hatch, F. M. Hatch and T. C. Haslett, all of Hamilton.

Trade Gossip

Belleville, Ont. — Word has been received here that the rolling mills which have been idle for some time, will resume work immediately.

Woodstock, Ont.—The Linderman Co., recently shipped a dovetail glue jointing machine to Newport, Tenn. The machine weighed 20,000 pounds.

L. K. Comstock & Co., contracting engineers have opened a Canadian office in the New Birks' Building, Montreal, with Douglas-Milligan Co., in charge as their representatives.

Kingston, Ont.—The following officers were elected by the Kingston Board of Trade: Honorary presidents, W. E. Nickle, M.P., and Col. A. E. Ross; president, Francis King; first vice-president. William Cook; second vice-president, J. M. Campbell; treasurer, George B. Mackay.

The Dominion Machinery Co., Toronto, have moved to larger offices in the Stevenson Bldg., Lombard and Church Streets, thus affording better facilities for handling their increasing business. The company is putting on the market a heavy duty single purpose lathe for 6 in. shells.

Great Lakes Shipping.—The volume of tonnage on the Great Lakes is so large that owners of vessels are contemplating breaking a channel through the ice to reach Escanaba on Lake Michigan. It is estimated that 55,000,000 tons of ore, 30,000,000 tons of coal and 14,000,000 tons of grain will be moved.

Canadian Locomotive Co.—At a meeting of the directors of the company at Kingston, Ont. The resignation of A. W. Wheatley was confirmed, but he will retain his position on the Board. J. J. Harty was appointed vice-president and sales manager, and elected to the board of directors. Wm. Casey is the new manager and J. H. Birkett secretary-treasurer.

C. N. E. Munitions Exhibit—Gen. Sir Sam Hughes, at the request of the Canadian National Exhibition Association, has instructed his officials to give whatever assistance is required in the preparation of a munitions process exhibit for this year's Exhibition, at Toronto, Ont. It is intended by the association to show in this exhibit every phase of the manufacture of shells, thus giving the patrons of the fair a knowledge of Canada's newest and largest industry.

A Steel Trade Anomaly—Steel trade authorities at New York note as an interesting fact that the smaller steel companies making finished products could sell all of the ingots and billets they can produce for months at relatively higher prices than can be realized for finished rolled products, so great and so urgent is the demand for crude and semi-finished steel. Such sales, however, would mean that the merchant plants would lose their organizations and be forced to give up the customers that they have secured through years of hardship and of painful effort. Consequently, in the long run, sales of ingots or billets in any magnitude, even at the highest prices ever recorded, would not only prove profitless but would be a suicidal policy. A great foreign and domestic demand for steel, therefore, goes unsatisfied.

Canada's Pig Iron Production.—The total production of pig iron in Canadian blast furnaces in 1915 was 913,719 short tons, valued at approximately $11,592,819, as compared with a production of 783,164 short tons in 1914 valued at approximately $10,002,856. A large proportion of this production is used directly in the manufacture of steel. and the values are in part estimated. The 1915 output shows an increase of 130,555 tons, or 16.67 per cent. over that of 1914, and compares favorably with the average of recent years. Of the total production in 1915, 13,692 tons were made with charcoal and 900,027 tons with coke.

Personal

A. Rissel, superintendent of the Montreal branch of the A. B. See Elevator Co. for a number of years, has served his connection with that firm.

Wm. Norris, manager of the Chatham, Wallaceburg & Lake Erie Electric Railway, died in London, Ont., recently. He was 50 years old, and was formerly connected with the London Street Railway Co.

J. E. Richards, general auditor of the London & Port Stanley Railway, has been appointed manager and treasurer of the road, succeeding F. T. Leversuch, who resigned.

J. McCormick, for the past nine years connected with the sales department of

Johns-Manville

JOHNS-MANVILLE SERVICE

COVERS THE CONTINENT

The Canadian H. W. Johns-Manville Co., Ltd.

Toronto Montreal
Winnipeg Vancouver

Serves More People In More Ways Than Any Institution Of Its Kind In The World.

WHEN we claim that J-M Products are "Reliable" we use the word in its severest interpretation. We mean the strictest adherence to constant, consistent goodness.

And even more than this; for as a second line defence, we re-inforce this Reliability with J-M Responsibility, the personal promise of a National Institution.

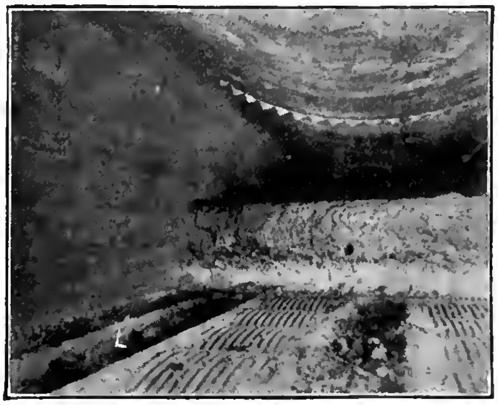
J-M High Temperature Cements prevent many a boiler shut down

—by protecting fire-brick edges

Any unprotected space between fire-bricks will start serious trouble with your fire box lining. And little openings exposing the edges of a brick here and there cannot be avoided when your bricks are dry. Expansion and contraction too, opens further cracks between the bricks even when the best grade of fire clay is used. These conditions allow furnace heat to concentrate at the brick edges and produce excessive temperatures familiarly known as "soaking." Every engineer knows that the fusion and spawling or cracking that follows sooner or later means **shut-down**—costly delays—expensive repairs.

Why not stop this annoying chain of troubles once for all, by setting up your fire-bricks with J-M No. 31 High Temperature Cements?

Vitrified by the heat, this cement fills every interstice and protects the brick edges with a perfect heat-reflecting surface—a fire box lining without weakness. J-M High Temperature Cements pay for themselves over and over by saving the cost of repairs and by eliminating shut-downs. Try them. There is a J-M High Temperature Cement for every refractory use.



Boiler furnace wall set with J-M No. 31 H. T. Cement in boiler-room of Christian Science Publishing Co., Boston. In continual use under stoker conditions for nearly a year and still good for an indefinite period.

J-M Fire-Proof Cold Water Paint makes shops and factories brighter.

Euclid Garage, 13th St., near Euclid Ave., Cleveland. "Largest in the World." J-M Fireproof Cold Water Paint.

J-M Fire-Proof Cold Water Paints are in demand for both inside and outside work. They increase the light reflecting capacity of interior walls to a point where lighting bills are often cut 25 per cent.

Easy to apply—by brush or spray. They are widely specified and every specification is backed by J-M Responsibility

They contain no oil, alkali, lime or chemicals and are mixed with ordinary water. They are endorsed by Underwriters as an approved fire retardant. Spreads farther and better than oil paints and does not discolor.

Service and Responsibility

Mussens Ltd., Montreal, has resigned having accepted a similar position in the machine tool department of the Canadian Fairbanks-Morse Co. of Montreal.

F. W. Evans has been appointed manager of the Toronto sales branch of the Canadian Fairbank-Morse Co., on Front St. Mr. Evans was until recently in charge of the machine tool department at Toronto and previously to that held a similar position at the head office in Montreal, moving to Toronto, when this department was moved to that city.

Wood-Working

Kedgwick, N.B.—The Richard Mfg. Co. lumber mill was destroyed by fire recently, but will be rebuilt.

Stratford, Ont.—A large addition will be built to the McLagan Furniture Mfg. Co.'s plant here.

New Westminster, B.C.—The Sidney B. Smith Lumber Co., will build a saw mill at Lombard near here.

Loretteville, Que.—The Joseph Boule & Co. planing mill has been destroyed by fire. The loss is estimated at $6,000, with no insurance.

Welland, Ont.—S. L. Lambert's planing mills were destroyed by fire recently. Loss is estimated at $25,000, which is partly covered by insurance.

Niagara Falls, Ont.—Reid Bros. will build a new planing mill near their present one. The new mill will be 26 ft. x 40 ft., and new machinery will be installed.

Orillia, Ont.—The Orillia Realty & Building Co's., planing mill, on Front Street, was destroyed by fire on Feb. 26. The building was totally destroyed with all the machinery. The loss, estimated at $10,000, being partially covered by $2,500 insurance. The Canada Builders, Ltd., of Toronto, owned the mill.

Building Notes

Toronto, Ont.—The Automobile and Supply Co. will build a showroom and garage on Simcoe Street at a cost of $24,000.

Winnipeg, Man. — The City Council has granted the T. Eaton Co. permission to erect bridges over certain streets in connection with the new building which they propose erecting here.

Toronto, Ont.—The Sheet Metal Products Co. have obtained a building permit for an addition to the factory on Oak Street, to cost $11,300.

Hamilton, Ont.—An addition will be made to the Robert Sand school at a cost of about $30,000.

Mount Dennis, Ont. — A new public school will be built here at an estimated cost of $25,000. Building operations will be commenced shortly.

Toronto, Ont.—The Hamilton Carhart Co., overall manufacturers, will build an addition to the factory on Queen Street East, at a cost of $4,000.

Toronto, Ont.—The Gutta Percha & Rubber Co. have been granted a permit from the city architect to erect a one-storey storage shed on West Lodge Avenue at a cost of $4,000.

Winnipeg, Man.—The T. Eaton Co. have submitted plans for a proposed twelve-storey warehouse to be erected on Graham Street. It is also planned to erect a new twelve-storey main building, the two buildings costing in the neighborhood of $3,000,000.

Railways—Bridges

Montreal, Que.—Work on the reconstruction of the burned Bonaventure Station has been begun by the G.T.R. It is understood the re-building is to meet temporary needs, pending the ultimate elevation of the G.T.R. tracks through this city and the building of a new station in connection therewith.

Montreal, Que. — The Montreal and Southern Counties Railway expects to be able to run to Granby by the end of March. The new machinery will shortly be installed in the sub-station. Granby will be the furthest objective point this coming summer; but that does not exhaust the original programme of development.

Chatham, Ont.—Extensions of the hydro network of lines in Kent County are being contemplated, and it is quite likely that many lines will be installed during the spring and summer. Many of the important towns in the county, including Wallaceburg, Dresden, Ridgetown, Blenheim and Thamesville are now served with hydro.

C. N. R. Plans Revised.—The Canadian Northern Railway had decided to drop its proposal of a line between Toronto and Hamilton, so as not to interfere with the Hydro Radials scheme, but will operate between Hamilton and St. Catharines and thence to the border. The application of the Toronto, St. Catharines and Niagara Railway, a subsidiary line of the C. N. R., for an extension of its franchise, which has been made at Ottawa, has revived interest in the activities of the C. N. R.

Catalogues

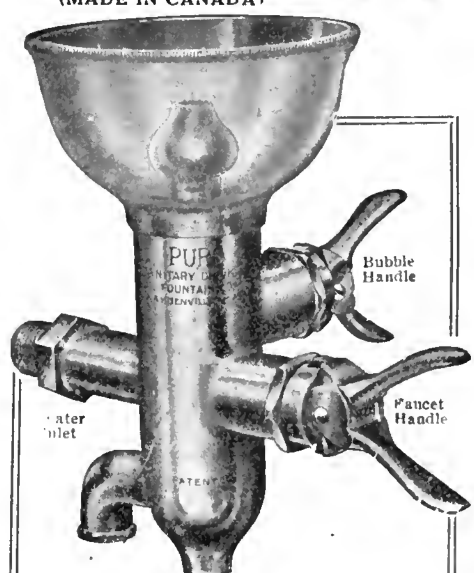
The Vislok Co., London, England, have sent us literature dealing with the "Gauge-All" expansible double boring cutter. The cutter has been designed to reduce the wastage in high speed steel, when used for internal work. How this is done is fully described in a booklet, and the illustrations show how to adjust the cutter. A price list for standard sections is also included.

Anodes and Plating Salts made by the Munning-Loeb Co., Matawan, N.J., are dealt with in bulletin No. 300. The bulletin contains much interesting information covering the manufacture of anodes and quality of raw material employed. Several different types of anode made of various metals are illustrated and described, while the sizes and approximate weights are also included. The concluding pages deal with various kinds of plating salts and their principal features.

The National Machinery and Supply Co., of Hamilton, Ont., have issued a catalogue illustrating and describing a full line of machinists' and woodworkers' tools. The products include several types of vises, planes, screw drivers, hand-screws, clamps, etc. A table accompanies each type and contains the weight and principal dimensions for each size. The prices are given in English currency as well as Canadian for the benefit of Old Country consumers.

Book Reviews

Magnetic and Other Properties of Iron-Silicon Alloys, Melted in Vacuo, is the title of bulletin No. 83 by Trygve D. Yensen, issued by the University of Illinois, Price 35c. The bulletin contains the investigations of Mr. Yensen in connection with a new material discovered by him. This material possesses properties particularly valuable in electrical industries and these properties are fully and carefully described in the bulletin accompanied by full particulars of tests and data obtained. This material is an iron-silicon alloy melted in a vacuum and annealed. It possesses remarkable magnetic properties which, are claimed to make it superior to any known metal for use in the manufacture of transformers, dynamos and electromagnetic machinery. The bulletin contains a number of tables giving results of tests, several diagrams, and also over 50 photomicrographs of this iron-silicon alloy. Copies of the bulletin may be obtained from the Engineering Experiment Station, Urbana, Ill.



Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

18 IN. x 10 FT. BRADFORD LATHE AND countershaft, also 18 in. x 8 ft. Lodge & Shipley, both in splendid condition; immediate delivery. Box 172. Canadian Machinery. (8)

FOR SALE—FIFTEEN HUNDRED GALLON Duplex Steam Pump, used sixty days. Size twenty x twelve x sixteen stroke. Apply Fraser & Chalmers of Canada, Limited, Montreal. (12)

FOR SALE—CINCINNATI ENGINE LATHE, 18" x 6'; taper attachment, hollow spindle, quick-change gears, compound rest, two chucks; also 12 H. P. gas or gasoline engine. Apply Wheeler Needle Works, Paris. Ont. (7)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London Ont.

FOR SALE OR TO EXCHANGE FOR A smaller tool—Bertram gap lathe, 16-ft. bed, swing 40 inches in gap, two face plates, one 4-jaw chuck, one steady rest, one turret head, and countershaft. All in first-class condition. Offered at a big reduction. Shipment could be made in ten days. Box 182, Canadian Machinery.

FOR SALE—THE FOLLOWING CANADIAN General Electric motors: 1 KT 8-5-900 C, 550 V., less base with pulley; 2 MTC 5200, 5 H.P., 900-500 V., 60 cyc., A.C., 3-phase, with solenoid brakes mounted, with controller and rheostat; 1 MTC 5200, 5 H.P., 900-500 V., 60 cyc., A.C., with controller and rheostat; 1 MTC 5200, 5 H.P., 900-550 V., 60 cyc., A.C., with controller and rheostat. Whiting Foundry Equipment Co., Harvey, Ill., U.S.A.

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double bandsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

FOR SALE—50 GOOD MACHINES. BOLT Cutters, Headers, Pointers, Tappers, Automatic Shavers and Slotters, Presses, Drill Press, Slitters, Small Shears, Plain Bench Lathes, Pulleys, etc. Bargain prices. Immediate shipment. Send for descriptive list and prices. Shelton Company, Shelton, Conn., U.S.A. (9)

FOR SALE, AT A SACRIFICE—SAW MILL outfit, A1 condition; 50 H.P. stationary boiler, 45 H.P. "Leonard" engine, "Green" carriage, Simonds saw, edger, planer, lathmill, etc. Easy terms. Write quick. R. Parker & Sons, Uno Park, Ont. (12)

FOR SALE—2-PHASE INDUCTION MOTORS, 1 only WESTINGHOUSE, Type C, 50 H.P.; 1 only WESTINGHOUSE, Type CCL, 50 H.P.; 1 only CANADIAN GENERAL, type 10, 20 H.P. In excellent condition. Prices attractive. Full particulars on application. Cummer-Dowswell, Limited, Hamilton, Ont.

FOR SALE—PLANING MILL AND FACTory, doing good business. Terms $2,000.00 cash. Balance to suit buyer. Address O. Ribble, Bronte, Ont. (13)

AUTOMOBILE BUSINESS AND NEW Garage for sale. Overland agency; lots of repairing; also Overland roadster, new tires, $300.00; 10 light D.C. generator, $25.00; K.W. magneto (new), $15.00. W. E. Hawes, Otterville, Ont. (13)

SITUATIONS VACANT

JUNIOR DRAFTSMAN, EXPERIENCE ON structural work an advantage; permanent position to right man; give fullest possible particulars. Box 174, Canadian Machinery. (7)

WANTED — MACHINISTS AND FLOOR hands on heavy and miscellaneous medium work; steady employment, modern shop, good wages. Apply, stating age and experience, P.O. Box 6, Walkerville, Ontario. (6)

SITUATIONS WANTED

MECHANICAL SUPERINTENDENT, EFFICIency engineer and master mechanic having twenty years' experience in all lines of general machine, blacksmith, carpenter and pattern shop practice, foundry work, power plant, refrigerating and electrical engineering, is open for engagement. Box 177, Canadian Machinery. (11)

CHIEF ENGINEER — 26 YEARS' EXPERIence. Factory and Central Station, Alternating and Direct Current, Gas or Steam Engines, efficiency guaranteed, own instruments, best of references. Box 181, Canadian Machinery. (12)

AS MAINTENANCE ENGINEER OF FACTory, power or lighting plant, where economy is a factor, wide experience, best of references. Box 180, Canadian Machinery. (12)

WANTED

WANTED TO RENT — SMALL MACHINE shop, two or three small lathes, miller, drill, motor, furnace, usual small tools. Full particulars and terms. Box 179, Canadian Machinery. (13)

AGENTS WANTED

BRITISH HOUSE MAKING SYRINGES AND spraying machines for every possible use, need Canadian agents. The line is the most complete in the world and includes knapsack and ordinary spraying machines for fruit growers, limewashing machines for farms, factories, etc. Disinfecting machines for all purposes. Anything in the way of spraying and washing machines made to suit the market. Agents must be aggressive and ready to work the line thoroughly. Write: Spraying Machines, c/o Canadian Machinery, 143 University Avenue, Toronto.

FOR SALE

Two 96-horse-power Gas Engines.

Complete with producers.

Made by the largest English manufacturers.

WILL SELL CHEAP

Empire Mfg. Co., Ltd.
London, Ontario.

POSITION WANTED

Electric-Hydraulic-Steam Engineer

of high calibre is open for position. Experience in Great Britain and America.

Box 178,
Canadian Machinery.

AGENCY WANTED

A firm in England is desirous of securing the sole agency for Great Britain for twist drills, taps, stocks, dies, reamers, milling cutters, etc. Please communicate full particulars to

Box 175
Canadian Machinery

20 precede pp. 253

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, MARCH 23, 1916 No. 12

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President H. T. HUNTER, Vice-president

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Mineral Production of Canada for Calendar Year 1915--I.

By John McLeish, B-A. *

The accompanying statistics have become available through the issuance of a preliminary report by the Department of Mines, Ottawa. Although subject to slight additions or modifications of detail pending final compilation at a later date, we believe a more than ordinary interest will be taken in the data presented, particularly on account of the war-created activity which has marked almost every section of Canada's mineral resources development.

As a result of the demand created by the war, our metal mining industry has, in 1915, shown the highest production ever recorded and notwithstanding the greatly decreased production of materials of construction, such as cement, clay and stone quarry produces, a very large increase is still shown in the total mineral output, over that of the previous year. The total value of the metal and mineral production in 1915, as shown in the preliminary report here presented, was $138,513,750, compared with $128,863,075 in 1914, and $145,634,812 in 1913, the latter being the highest production recorded. The increase in 1915 over 1914 was thus $9,-650,675, or 7.49 per cent., but the output is still less than that in 1913 by $7,-121,062.

Development Scope Enlarged

Without attempting to discuss at length the effect of the war upon the Canadian mining industry, it may be remarked that the demand for the metals, copper, lead, nickel and zinc, led to great activity in the operation of the already developed deposits of these metals, and also, later in the year, to the opening up of old and the exploitation of new deposits. The capacities of steel furnaces were taxed to the utmost to meet the demand for shell steel. The fact that under war conditions it was desirable that our metals should become available for commercial or national use entirely within the country, and that we should be less dependent, even upon a friendly neutral for their recovery in smelters and refineries, has stimulated the development of our smelting and refining operations.

Amongst non-metallic minerals the recovery of benzol and toluol in by-product coke oven operations was a direct result of the war, as was also the activity in the mining and shipment of magnesite and of chrome ores. The limitation placed by the Government upon the export of certain minerals and metals may have caused inconvenience and interruption to certain industries but these were usually adjusted by the issue of special licenses for export where it could be shown that such export was not for enemy destination but was in the interest of Great Britain and her Allies.

*Chief of Mineral Resources and Statistics Division, Mines Branch, Department of Mines, Ottawa.

The mining and metallurgical industries include a great variety of products so that in dealing with the industry as a whole the total value presents the only means of comparison, nevertheless quantities of production and prices are at all times the items of essential importance.

Metals Production

There has been an increased production in all metals with the exception of silver. The total value of the metallic production in 1915 was $77,046,082 as compared with $59,386,619 in 1914, and $66,361,351 in 1913, the increase over 1914 being nearly 30 per cent., and that over 1913 the highest previous year, about 16 per cent. The production of nickel, copper and zinc are the highest that have been recorded in these metals. The quantity of nickel was 50 per cent. greater than in 1914, copper over 35 per cent. greater, lead nearly 25 per cent. greater, gold over 18 per cent. and pig iron nearly 17 per cent. The falling off in silver was only 48,000 ounces or less than two-tenths of one per cent. Owing to the high prices of copper and lead, the total values of these metals show increases of 72 per cent. and 56 per cent. respectively.

Although the prices of nearly all metals have been high they have in most cases been exceeded in comparatively recent years except possibly in antimony and zinc, and some of the rarer metals. Compared with 1914, the average price of copper shows an increase of 27 per cent., lead an increase of 27 per cent. spelter an increase of 154 per cent., antimony (ordinaries) an increase of 246 per cent., silver a decrease of 9.4 per cent. and tin an increase of 12.2 per cent.

Non-Metals Production

The total value of the non-metallic production in 1915 including clay and quarry products, etc., was $61,467,668 as against $69,476,456 in 1914; $79,273,461 in 1913. Compared with 1914 the decrease was $8,008,788, or 11.5 per cent., while compared with 1913 the falling off was $17,805,793 or 22.5 per cent. It will be seen that the largest decreases in 1915 occurred in materials of construction such as cement, clay products, lime, sand and gravel, and stone and quarry products, the falling off varying from 16 to nearly 34 per cent. There was, however, also a smaller production of coal, natural gas and gypsum. On the other hand there were increases in the shipments of asbestos, chromite, graphite, magnesite, pyrites and salt.

Mineral Production by Provinces

The record of mineral production by provinces shows the relative importance of the provinces in the same order as in the previous year with the exception that Quebec and Alberta change places, the former having the larger production in 1915. An increase in production is shown in the provinces of Nova Scotia, Quebec, Ontario, and British Columbia, and a decrease in New Brunswick, Manitoba, Saskatchewan, Alberta and the Yukon district.

Ontario again has the largest output with a value of $61,800,178, or 44.6 per cent. of the total, and showing an increase over 1914 of $8,765,501, or 16.5 per cent. British Columbia occupies second place with a value of $28,932,-658, or 20.9 per cent. of the total and showing an increase of $4,768,619, or 19.7 per cent. over 1914. Nova Scotia is third with a production valued at $18,-126,672, or 13.1 per cent. of the total and showing an increase of $542,033, or 3.1 per cent. over 1914. Quebec comes fourth with a value of $12,159,436, or 8.8 per cent. of the total, and an increase over 1914 of $322,507, or 2.7 per cent. Alberta occupies fifth place with a production of $9,915,282, or 7.2 per cent. of the total and showing a decrease of $2,768,952, or 21.8 per cent. compared with 1914. The Yukon district mineral production including copper and coal, as well as gold, is sixth, with a value of $4,915,863, or 3.6 per cent. of the total and a falling off from 1914 of $502,-322, or 9.3 per cent. Manitoba's production was $1,351,604, a falling off of $1,-061,885, or 44 per cent. New Brunswick's production was $916,329, a decrease of $98,241, or 9.7 per cent. and the production of Saskatchewan was the smallest, being $395,728, or less than that of 1914 by $316,585, or 44.4 per cent.

Gold

The total production of gold in placer and mill bullion and in smelter products in 1915 is estimated at 916,076 fine ounces valued at $18,936,971, as compared with 773,178 fine ounces valued at $15,983,007 in 1914, an increase of $2,953,964 or 18.5 per cent. Although

the production has more than doubled since 1907 it has not yet reached the high mark attained during Klondike's best years. The 1915 output was exceeded during each of the four years from 1899 to 1902. Of the total production in 1915 about $5,550,987 was derived from placer and alluvial mining, $9,195,307 in bullion and refined gold, and $4.230,677 contained in matte, blister copper, residues and ores exported.

The production in Nova Scotia was about $137.178, or over twice the output of the previous year. The pyrites ores of Quebec carry small quantities of gold and silver, though the producers are not paid therefor. No placer recovery was reported from this province. Ontario has now become the largest gold producing province in Canada, the production in 1915 from fifteen properties being reported as $8.386.956, or 44 per cent. of the total production in Canada, as against a production in 1914 of $5,545,509, an increase of $2,841.447, or 51 per cent. The Hollinger and Acme Mines contributed about one-half of the output in 1915 and the Dome nearly one-fifth of the total. No production of gold has been reported in either Manitoba or Saskatchewan although some development work has been done. From Alberta record has been obtained of the recovery of about $4,000 of alluvial gold.

The production in British Columbia was $5 628.982, including $755,000 estimated by the provincial mineralogist as being the output of placer workings, and $4.873.982 recovered from milling and smelting ores. In 1914, the production was $5.224.393, including $565,000 from placer workings and $4,659.393 from milling and smelting ores.

The Yukon production in 1915, including a small recovery from copper ores, was $4.755.721, a decrease of $369,653 from the 1914 production. The amount of gold on which royalty was paid during the year 1915 according to the records of the Mining Lands and Yukon Branch, Interior Department, was 287.254.15 ounces, as against 309,691.17 ounces in 1914, and 352,900.04 ounces in 1913. For purposes of the royalty this gold is valued at $15 per ounce although the actual value is probably nearer $16.50. The receipts at the Dominion of Canada Assay Office, Vancouver, were 87,284.35 ounces, valued at $1.421.292.37 or an average of $16.28 per ounce. The exports of gold bearing dust, nuggets, gold in ore, etc., in 1915 are reported by the Customs Department as $16.528.143.

Silver

The production of silver was 28.401,735 ounces valued at $14.088.397, as against 28 449 821 ounces in 1914, valued at $15.593,630. Silver is the principal metal that did not show an increased production in 1915. The falling off in quantity was very small, however, amounting to only 48,086 ounces. Owing to the lower price of silver, the decrease in total value was $1,505,234 or over 9.6 per cent. Of the total production in 1915, 24,653,057 ounces, or about 86.8 per cent. is credited to Ontario.

The production from the ores of Cobalt and other silver camps was 23,568,147 ounces including 19,893,639 ounces in bullion recovered in smelters and cyanide plants in Canada and 3,674,508 ounces estimated as recovered from ores exported to United States smelters. The quantity credited to gold ores was 84,910 ounces. The total production in 1914 was estimated at 25,139,214 compared with which the 1915 recovery shows a decrease of 1,571,067 ounces. Of the silver in bullion, 10,623,307 ounces were produced in smelters in Southern Ontario, and 9.270,332 ounces in the mills at Cobalt, the total in bullion being over 84 per cent. of the production of the district.

The production in British Columbia, representing refined silver, silver contained in smelter products, and estimated recoveries from ores exported, was in 1915, about 3.628,727 ounces as compared with 3,159,897 ounces in 1914, an increase of 468,830 ounces, or over 14 per cent.

In Quebec province there is a small silver content in the pyrites ores shipped, while in the Yukon 58,382 ounces are estimated as being contained in the placer gold produced and recovered from copper ores. The exports of silver bullion and silver in ore, etc., as reported by the Customs Department, were: 27,672.481 ounces valued at $13,812,038.

Copper

The copper output in 1915 was the highest recorded. The production in smelters together with the estimated recoveries or amounts paid for in ores exported amounted to 102,612.486 pounds which at the average New York value of refined copper would be worth $17,726.307. The highest previous production was in 1912 when an output of 77,832,127 pounds was reached. Compared with the production in 1914 which was 75,735.960 pounds valued at $10,301,606, an increase is shown of 26,876,526 pounds or 35 per cent., and in total value of $7,424.701, or 72 per cent.

Of the total 1915 production, 42,050,347 pounds were contained in blister copper, 44.230,052 in copper and copper nickel matte, and 16,332,087 recovered from ores exported.

The production in Quebec from pyrites ores was 6,082,003 pounds as against 4,201.497 pounds in 1914. The Ontario production is derived chiefly from the nickel-copper ores of the Sudbury district and of the Alexo mine, although there is a small amount of copper contained in the silver ores shipped from Cobalt, some of which is paid for. There was also a small shipment from the old Massey mine which was re-opened during the year. The production in 1915 is reported as 39,303,279 pounds as against 28,948,211 pounds in 1914 an increase of 10,355,068 pounds or 35.7 per cent. Further detail respecting production will be found in the remarks on nickel.

British Columbia also shows a largely increased production in 1915, the total being 56,692,988 pounds as against 41,219,202 pounds in 1914, an increase of 15 473,786 pounds or 37.5 per cent. The 1915 production in this province included 47,064,234 pounds recovered in blister and matte, etc., and 9,628,754 recovered from ores shipped to smelters outside of Canada. The Coast mines including the Britannia, Texada Island and Anyox mines, etc., are credited with 33.980.508 pounds, and the Trail Creek and Boundary mines with 22,712,480 pounds. The Yukon production is reported as 534,216 pounds as against 1,367,050 pounds in 1914.

Exports of copper according to Customs records were:—Copper fine in ore, etc., and copper in pigs 102.729,579 pounds valued at $12,460,356; there were also exports of old and scrap copper amounting to 4,161,600 pounds valued at $616,553.

The total value of the imports of copper in 1915 are recorded as $3.467,586 as against $4,256,901 in 1914. The imports in 1915 included $16,818,116 pounds of copper in pigs, ingots and manufactures, valued at $3.104,382; other manufactures valued at $263,922, and copper sulphate 1,854,850 pounds, valued at $99.282. The imports in 1914 included 26.280,815 pounds crude and manufactured copper valued at $3,983,322, copper sulphate 1,143,039 pounds valued at $53,802, and other manufactures of copper valued at $219,777.

Nickel

Refined metallic nickel is now being recovered in Canadian refineries but only in small quantities and as a by-product in the smelting and refining of the silver-cobalt-nickel ores of the Cobalt district, nickel oxide having been recovered in these smelters for several years. The nickel-copper ores of the Sudbury district supplemented by a small tonnage of similar ores from the Alexo mine in Timiskaming, north of Cobalt are the main sources of nickel production which in 1915 increased nearly 50 per cent. as compared with 1914, and is greater than the production in 1913, the largest previous record, by over 37 per cent.

The nickel-copper ore, derived from 12 separate mines, is reduced in smelters and converters to a Bessemer matte con-

taining from 77 to 82 per cent. of the combined metals and shipped in that form to Great Britain and the United States for refining, the product of the Canadian Copper Co. going to New Jersey, and that of the Mond Nickel Co. to Wales. A portion of the matte produced by the Canadian Copper Co., is used without the intermediate refining of either metal for the direct production of Monel metal, an alloy of nickel and copper.

The total production of matte in 1915 was 67,703 tons, containing 39,216,165 pounds of copper and 68,077,823 pounds of nickel and valued by the producers at $10,352,344. The tonnage of ore smelted (part being previously roasted) was 1.272.283. The production in 1914 was 46.396 tons of matte containing 28,-895,825 pounds of copper and 45.517,-937 pounds of nickel and valued at $7,-189,031. The reported recovery of nickel from the ores of the Cobalt district was 55,325 pounds of metals and 200,032 pounds of nickel oxide. The recovery in 1914 was 392,512 pounds of nickel oxide.

The exports of nickel are reported by the Customs Department as 66,410,400 pounds valued at $7,394,446 or an average of 11.13 cents per pound. Since about 80 per cent. of the Canadian nickel production is exported to the United States, it may be of interest to add to the Canadian statistics a record of the imports (eleven months only in 1915) of nickel into and the exports from the United States.

The exports of nickel from the United States during the eleven months ending November were 24,503,585 pounds valued at $9.299,234 or an average of 37.95 cents per pound. More than 50 per cent of these exports went to the United Kingdom. The value of the United States exports in 1914 ranged from 31 to 39 cents per pound ahd averaged about 34 cents. It will be noted that a larger quantity of nickel finds its way to the United Kingdom through United States refineries than is exported directly from Canada.

Lead

Although there was an increase of nearly 25 per cent. in the production of lead, the 1915 output has been exceeded in six of the past 15 years. The production of lead in 1914 was 45,377,065 pounds, which valued at 5.60 cents per pound, the average price of pig lead in Montreal for the year, would be worth $2,541.116. The production in 1914 was 36.337,765 pounds valued at $1,627,568, or an average of 4.479 cents per pound. The 1915 production consists chiefly of pig and manufactured lead produced at Trail, B.C., but includes also an estimate of the lead probably recoverable from ores shipped to smelters outside of Canada. The entire output of the Surprise mine in the Slocan District, B.C., was shipped to the United States, refined in bond, and sold in London.

The exports of lead in ore, etc., in 1915 are recorded by the Customs Department as 1,845,100 pounds valued at $40.273, and of pig lead 2,066,929 pounds valued at $79,067. Exports in 1914 were 246.100 pounds of lead in ore and 510,-573 pounds of pig lead.

The total value of the imports of lead and lead products in 1915 was $2,479,-261 as against $1,042.538 in 1914. The 1915 imports included 42,616,200 pounds valued at $2,010,006, manufactured lead 3,102.838 pounds valued at $184,581, other manufactures valued at $102 439, litharge 1,579.800 pounds valued at $89,-232 and lead pigments 1,709,035 pounds valued at $93,003. The imports of litharge and pigments would contain approximately 1,565 tons of metallic lead and the total import of lead would therefore exceed 24,425 tons as shown by this record. The imports in 1914 were equivalent to about 10,869 tons.

Zinc

Complete returns of zinc shipments have not yet been received but the tonnage is estimated at 15,553 tons containing 12.400,000 pounds of zinc. Shipments include several hundred tons from Notre Dame des Anges, Quebec, but the greater part is from fifteen properties in British Columbia. Zinc shipments in 1914 were reported as 10,893 tons containing 9.101,460 pounds of zinc.

The Consolidated Mining & Smelting Co., at Trail, B.C., after successful experimental development has installed at Trail a zinc recovery plant, having an initial daily capacity of 35 tons of refined zinc, and has entered into a contract with the Shell Committee for a considerable tonnage of zinc to be delivered during 1916. A small quantity of zinc was recovered during 1915 in connection with the experimental work. The Electric Zinc Co. has constructed a plant at Welland, Ont., for the recovery of refined zinc from zinc oxide. It is intended eventually, to treat the zinc ores from Notre Dame des Anges, Quebec, at this plant. At Silverton, B.C., a demonstrating plant, using the French process for the recovery of zinc, was operated during 1915 and satisfactory results are claimed.

Other Metals

Antimony.—After several years of no production the demand and high prices in 1915 caused a renewal of activity in mining antimony ores at West Gore, Nova Scotia, and Lake George, New Brunswick. About 1.288 tons of concentrates were shipped to England from the former locality. The antimony smelter at Lake George was operated toward the end of the year with a small production of refined antimony, and there was also some recovery of refined antimony at the lead refinery at Trail, B.C. Antimony ores are also reported to have been shipped from Carpenter Creek, Slocan, from Bridge River District, Lillooet, B.C., and from the Yukon but no record has been obtained. The total production reported is estimated at about 961.040 pounds of antimony refined and in concentrates. The recorded exports of antimony ore in 1915 were 1.149 tons valued at $82,990, while the imports included antimony or regulus of, etc., 1.962,194 pounds valued at $344.918 and antimony salts 67.956 pounds valued at $10,320.

Cobalt.—Metallic cobalt is now being recovered as well as cobalt oxide at the smelters at Deloro and Thorold. The silver-cobalt-nickel ores of the Cobalt district are reduced in these smelters, silver being the principal product with arsenious oxide, metallic cobalt and nickel, cobalt oxide and nickel oxide as by-products. Returns received show a production in 1915 of 211 610 pounds of metallic cobalt and 379.219 pounds of cobalt oxide, equivalent to a total of 477.063 pounds of metal. In 1914 the production was reported as 899.027 pounds of cobalt oxide and 242 572 pounds of cobalt contained in residues sold outside of Canada or equivalent to a total of 871.891 pounds of cobalt. The price of cobalt is seldom quoted.

Molybdenum.—A production has been reported of about 28.600 pounds of molybdenite valued at $28.460, including cobbed molybdenite and molybdenite contained in ore shipped to concentration plants. There were also about 50 tons of low-grade ore sent to the Mines Branch Ore Testing laboratories for experimental concentration. The export of molybdenite was prohibited to other than British destinations except under license, and from September 23rd the British Government requisitioned all molybdenite arriving in the United Kingdom at a price of 105 shillings per unit of MoS_2, C.I.F. Liverpool and appointed H. A. Watson & Co., Liverpool, as buyers.

Platinum.—Efforts are being continued to recover platinum from the gravels on the Tulameen river in the Similkameen district of British Columbia, and there is also occasional recovery of small quantities from the gold gravels of Quesnel division, Cariboo district. A recovery of about 20 ounces is reported in 1915. There was no recovery of platinum from the Sudbury nickel-copper mattes. Customs records show an export of platinum of 236 ounces valued at $11,052, but this may possibly include old metal.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

MACHINING AND ASSEMBLING ENGINE PISTON VALVES

By George Black

THE methods herein described may prove of interest and profit to readers of "Canadian Machinery," being, as they are, the result of careful thought and planning in a shop with which the writer was connected. Not the least important factor in the situation was the routing or progress of the component parts through the shop, and a new layout of the machine tools and benches was arranged in order that they should be in the correct position to receive the work and perform the operations in the sequence required, thereby saving much time and labor; as material, once issued from the rough stores, automatically progressed along a definite path, in one direction, towards the assembling benches, unnecessary trucking being eliminated.

This arrangement relieved the foreman from "chasing material" and enabled him to devote a greater proportion of his time to the supervision and quality of the work.

Before proceeding to deal with the machining of the component parts, it may be of interest to state that the shop was handled on a piece-work basis with a guaranteed pay rate. no limit being set upon an operator's earnings, who also had the assurance that no price, once set, would be reduced, unless a change in method was adopted. The machine operations were first of all selected by the tool and jig department, then carefully tried out in the shop. improvements effected if possible, and the whole operation firmly established. With the knowledge of the capacity of the machine and a suitable allowance for tools, gauging and the addition of a "fatigue factor," the piece-work rates were then set for the average operator and from the records kept it was shown that 20 per cent. of the operators increased their earnings by 70 per cent.; 60 per cent. earned an increase of from 35 to 50 per cent. over their day-work rates, while the balance averaged from day rate to 25 per cent. increase; the net result was a satisfied crowd of operators and an equally satisfied management.

Type of Valve.

The type of piston valve under consideration is shown in Fig. 1, where A is the body or spool, BB' are the bull-rings. e e e e the packing rings and D D' are the followers. The material used in the construction of the valve is a good close-grained cast iron. with the exception of the followers, and these are made of wrought iron or mild steel in drop forgings or stampings; the heavy first cost of the dies being very largely offset by the fact that a stamping invariably makes a good piece. When made from either cast steel or iron, there is always a proportion of scrap, which represents valuable machine hours. caused chiefly by blow-holes developing when partly machined; this is a complete loss, not to mention the inconvenience, which is so much greater when the follower is made of malleable cast, due to the length of time required for the process, and which is generally aggravated by late delivery of material.

In actual service, the balance is again in favor of the drop forging, for with the inherent strains due to cooling in the case of the castings, further magnified by the removal of the outside skin in machining, it is not unusual to find cracks developing, principally in the fillets, at the points where the arms join the rim; see Fig. 2, which is a sketch of the follower, and represents a section taken through the centre.

First Operation.

The first operation is to rough drill the valve rod hole, and is expeditiously handled in a No. 2 Baker drill. See Fig. 3. The detail operations are:

	R.P.M.	Feed per rev.	Min.
Set and clamp follower			1.0
Drill 1—1¾" hole	105	.005	7.5
Remove job. Clear chips ...			.5
		Min.	9.0

Note: Not necessary to spot and draw hole. Bottom die leaves a center for drill.

Second Operation.

The follower then passes to a 24-in. Bullard vertical turret lathe, where the 2nd operation. as indicated by f finish marks in Fig. 2 is performed. Fig. 4 shows the piece in the machine and indicates the method of chucking same. The usual time for this operation is .45 hours, the detail operations being:

Operation—	Rev. per min.	Feet per min.	Depth of cut.	Feet per rev.	Time in Min.
(1)—Chuck and true up					2.00
(2)—Set center head and cut					.25
(3)—Face at A	31	100′	⅛"	.014"	
(4)—Set side head, tool and cut					.25
(5)—Turn O.D., face flange at B	31	115′	3-16"	.014"	3.00
(6)—Reset side head and cut					.5
(7)—Rough turn dia C.	31	100′	5-16"	.014"	7.00
(8)—Set center head and cut					
(9)—Bore valve rod hole	31	15′	3-32"	.014"	
(10)—Reset side head and cut, change speed.......					.5
—Turn dia. C, 2nd cut	38	120′	3-16"	.014"	6.0
(12)—Reset side head and cut, change speed.......					.5
(13)—Finish turn flange at B	45	150′	1-32"	.014"	1.5
(14)—Reset side head and cut					.25
(15)—Square out corner	45	140′	1-64"	H.F.	1.5
—Reset center head and cut					.5
(17)—Face at A to depth	45	140′	1-16"	.014"	.75
(18)—Remove piece. Clear chips					1.00
				Mins	25.50

Third Operation.

The third operation to the follower (see f marks, Fig. 2) is handled by the same type of machine and is chucked by dia. C in a universal chuck, but to avoid distorting the work a heavy dog is bolted to the face plate which engages one of

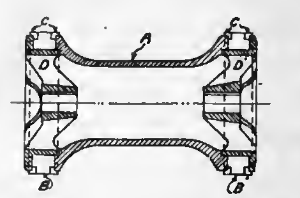


FIG. 1. SECTION THROUGH PISTON VALVE.

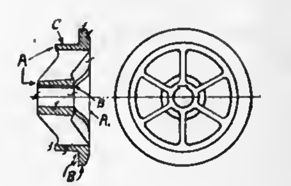


FIG. 2. SECTION THROUGH CENTRE OF FOLLOWER.

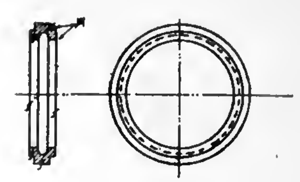


FIG. 6. BULL RING.

the arms of the follower, thus giving a strong and positive drive.

The detail instructions in this case are:

	Rev. per min.	Feet per min.	Depth of cut.	Feet per rev	Time in Min
(1)—Chuck					.75
(2)—Set center head and cut					.5
(3)—Face flange A, 2 tools in head	25	90′	¼″	.014″	5.0
(4)—Face flange B, 2 tools in head					
(5)—Reset center head and cut, change speed and feed.					.5
(6)—Face flange A, 2nd cut					
(7)—Face flange B, 2nd cut	31	110′	1 16″	.027″	2.25
(8)—Set side head and cut					
(9)—Turn O. D. of flange					
(10)—Reset center head	31	110′	¼″	.027″	1.00
(11)—Radius edge of bore					
(12)—Reset side head and cut					
(13)—Bevel edge of flange					.5
(14)—Check work. Remove burrs	31	110′	1-16″	H.F.	1.5
(15)—Remove piece. Clear chips					1.0
				Mins.	13.50

Note: When time is omitted two heads are working. Time for one only given.
H.F.=Hand feed.

Fourth Operation.

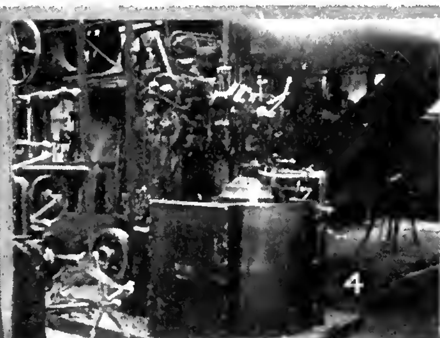
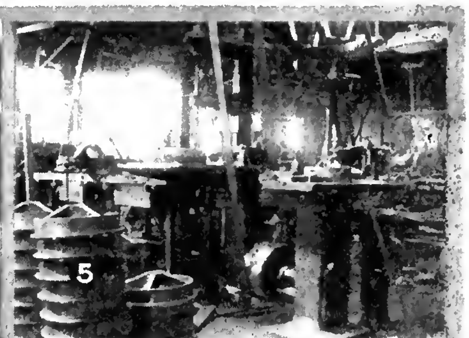
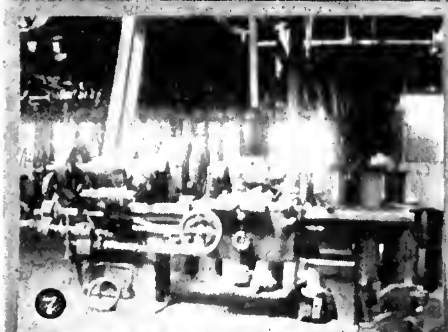
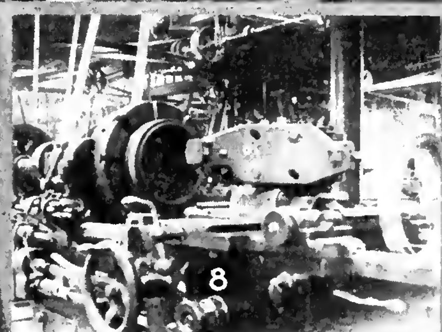
The next operation is that of cutting the ⅛ in. x ⅜ in. keyway in a Baker keyseating machine, which is seen in Fig. 5. The follower is located from the O.D. by a vee plate and clamped in the usual way. The details are:

	No. of strokes	Feet per min.	Feed	Time in min.
(1)—Set and clamp follower				1.00
(2) Cut keyway	30	18	H.F.	2.5
(3)—Remove and clear chips				1.00
			Total time:	4.50

The follower now passes to the assembly bench for a burr-filing operation before being assembled.

Bull Ring.

In the meanwhile the bull-ring, see Fig. 6, is turned and bored complete in two operations, on a 22-in. Bullard horizontal turret lathe, which is equipped with



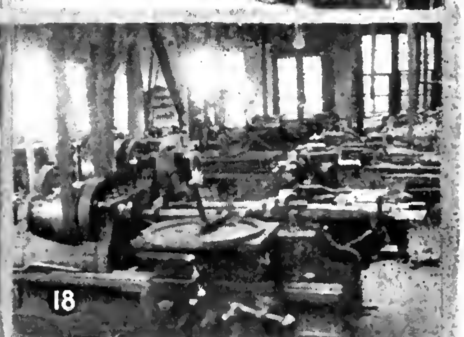
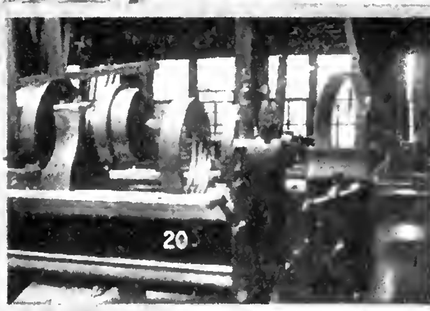



Fig. 3—Rough drilling valve rod hole in follower on "Baker" drill.

Fig. 4—Machining follower on "Bullard" vertical turret lathe.

Fig. 5—Cutting follower keyway on "Baker" key-seating machine.

Figs. 7 and 8—Turning and boring bull ring on "Bullard" horizontal turret lathe.

Fig. 9—Drilling body or spool on "Slocum" drill.

Fig. 10—Turning, facing and recessing body or spool on "LeBlond" lathe.

Figs. 12, 15, 18 and 20—Progressive stages in machining valve rings.

both cross and longitudinal stops, A A, in Fig. 8.

A feature of this operation is the special tool-holders with which the turret is equipped, and which may be recognized in place in both Figs. 7 and 8, while in the Fig. 7 several are seen on the floor to the right hand of the lathe. These tool holders are very rigid and enable the operator to take "sweeping" cuts on face A, Fig. 6, and in addition, the bore or outside diameter can be machined by the tool which is carried in the projecting lug or arm.

First Operation.

Fig. 7 illustrates the first operation, the bull-ring being gripped on the outside in a four-jawed chuck, and the operation consists of:

	Rev. per min.	Feet per min.	Depth of cut.	Feet per rev.	Time in Min.
(1)—Chuck and true up					2.0
(2)—Rough bore and turn step	18	57′	3-32″	.037″	4.0
(3)—Change speed					
(4)—Rough face step	12	38′	Sweep	H.F.	1.0
(5)—Reset tools and cut stack jaws and change feeds..					1.5
(6)—Finish bore and face step	18	57′	1-32″	.015″	8.0
(7)—Face step	18	57′	Sweep	H.F.	.5
(8)—Reset tool and cut					.5
(9)—Finish face step	18	57′	1-64″	.015″	2.5
(10)—Remove addage, check work					.5
(11)—Remove work. Clear chips					.5
					Min. 21.0

Second Operation.

The second operation on the bull-ring is handled on the same type of machine, but in this operation a cast iron plate is bolted to the face-plate and has a shallow spigot turned to just fit the bore of the bull-ring; this spigot centres the bull-ring, which is secured by three clamps to the face-plate. These clamps "take" upon the cored recess in the bull-ring and a glance at Fig. 8 will show that the arrangement insures the outside diameter being concentric with the bore and that the method of clamping, while holding firmly, does not distort the ring at all. Fig. 8 also illustrates the use of the tool-holder very well, for in the holder marked 5 will be seen three tools, which will machine respectively the outside diameter, the face and the step at one operation. The items in this operation are:

	Rev. per min.	Feet per min.	Time in Min.	Feet per rev.	Depth of cut.
(1)—Clamp on jig					1.5
(2)—Set tool and cut					.5
(3)—Rough turn O. D. and step	15	52′	3-32″	.037″	3.0
(4)—Change speed. Rough face step	12	42′	Sweep	H.F.	1.0
(5)—Reset tools and cut. Change speed and feed..					1.5
(6)—Finish turn O. D. and step	15	52′	1-32″	.015″	6.0
(7)—Face step	15	52′	Sweep	H.F.	.5
(8)—Reset tool and cut					.5
(9)—Finish face step	15	52′	1-64″	.015″	2.5
(10)—Remove addage. Check work					.5
(11)—Remove work. Clear chips					.5
					Min. 18.0

Assembling.

After the work has been viewed or inspected the ring is ready for the assembling bench, where the dowel pin hole will be drilled and the pin applied.

HYDRAULIC PRESS RATING

IN the last question appearing in the Feb. 17 issue of Canadian Machinery, page 150, the solution of the problem appears satisfactory; in fact, manufacturers of these presses designate them as of 150 tons. In reality, however, the term is not correct. The pressure, while acting at six equidistant points, is evenly distributed around the circumference, and each cylinder is resisting the pressure of the cylinder opposite. To illustrate, Fig. 1 shows a sectional view through the centres of two opposite cylinders of a hydraulic press. When the spring A is completely compressed, the gauge registers 500 lbs. per sq. inch; this will be the pressure in all the hydraulic connections, from the pump to the cylinder chamber. With a diameter of 8.75 inches, the pressure on each of the two cylinders B and C, acting in the direction of the arrows will be $500 \times 8.75^2 \times .7854 = 30{,}066$ lbs., or about 15 tons.

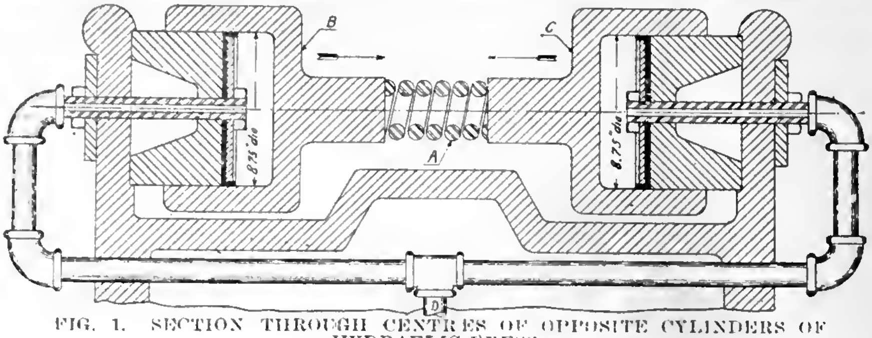


FIG. 1. SECTION THROUGH CENTRES OF OPPOSITE CYLINDERS OF HYDRAULIC PRESS.

It might appear that this force of 15 tons acting on each piston exerts a pressure of 30 tons upon the spring, but in reality the force of 15 tons is only acting against a similar resistance from the opposite cylinder.

To further illustrate this principle, take the single cylinder hydraulic press shown in section in Fig. 2. It is quite evident that with a pressure of 500 lbs. per sq. in. showing on the gauge, the force acting in the direction of the arrow will be the same as that in Fig. 1, and the pressure on C, due to the action of the spring under compression will equal the diametrical opposed press shown in Fig. 1.—J.H.R.

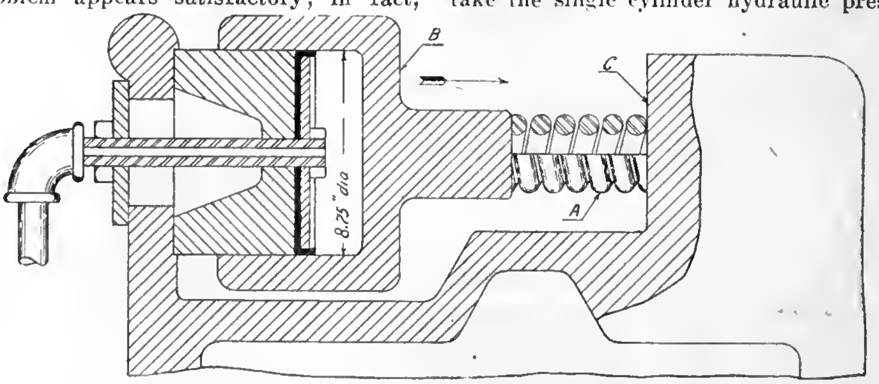


FIG. 2. SINGLE CYLINDER HYDRAULIC PRESS SECTION.

Galt, Ont.—The Board of Trade has elected the following officers for the ensuing year: Hon. president, F. S. Scott, M.P.; president, C. E. A. Dowler; vice-president, W. W. Wilkinson; treasurer, W. Philip; secretary, J. H. Hancock.

NEW PROCESS DEVELOPMENTS

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

BAKELITE—AN ACCESSORY MANUFACTURING MATERIAL

THE debt which civilization owes to students of applied science can only be understood, and that very slightly, by endeavoring to picture the conditions under which we would have to exist, should many well-nigh indispensable products suddenly cease to be available. The requirements of chemical and physical research have resulted in numerous substances and materials being evolved, which after fulfilling their original purpose have become intimately associated with existing industrial processes by reason of their superiority over various existing materials.

Origin of the Material

A material of this nature has been in course of commercial development for some years and its various advantages over several existing materials renders it unique amongst the products of modern science. Bakelite takes its name from its inventer, Dr. L. H. Baekeland, a native of Belgium, and for many years resident in the United States. His discovery of so-called "gas-light" photographic papers broght him international fame, which has been considerably enhanced by the everspreading use of bakelite, the ultimate applications of which are not yet in sight.

Bakelite is a distinct, well-defined chemical substance, resulting from the union under certain conditions of carbolic acid and formaldehyde. These two odorous and unpromising liquids form a transparent, amber-like solid, possessing the chemical name of oxy-benzylemethyl-englycol-anhydride, or phenol gum, i.e., Bakelite.

The combination of qualities possessed by this substance suggests its usefulness in many manufacturing lines. Briefly enumerated they are these, no smell, no taste, strong, durable, heat resistant, non-inflammable, unaffected by water, steam, oils, solvents, and most chemicals, while as a dielectric or insulating material it has few, if any, superiors.

Electric Applications Numerous

The great extent to which electricity has entered into modern living conditions has been one of the reasons that electrical applications of this material are more numerous than others. The fact that a temperature of 600 deg. Fahr. is necessary to produce bakelite, and that suitable grades withstand almost as high a temperature in use, gives it a decided advantage over hard rubber for insulating purposes, especially as it retains its shape at all temperatures up to the limit mentioned.

In using it for insulating purposes, the transparent gum has suitable binding or filling materials incorporated with it which add greatly to its strength. While in a plastic state it is put into molds and submitted to pressure at a high temperature for a few minutes. Exactness of shape and size is a characteristic of these moulded pieces. Each one comes from the die an exact duplicate of every other one, the edges and lines are sharp and clean, and the piece fits in place as in interchangeable machine construction.

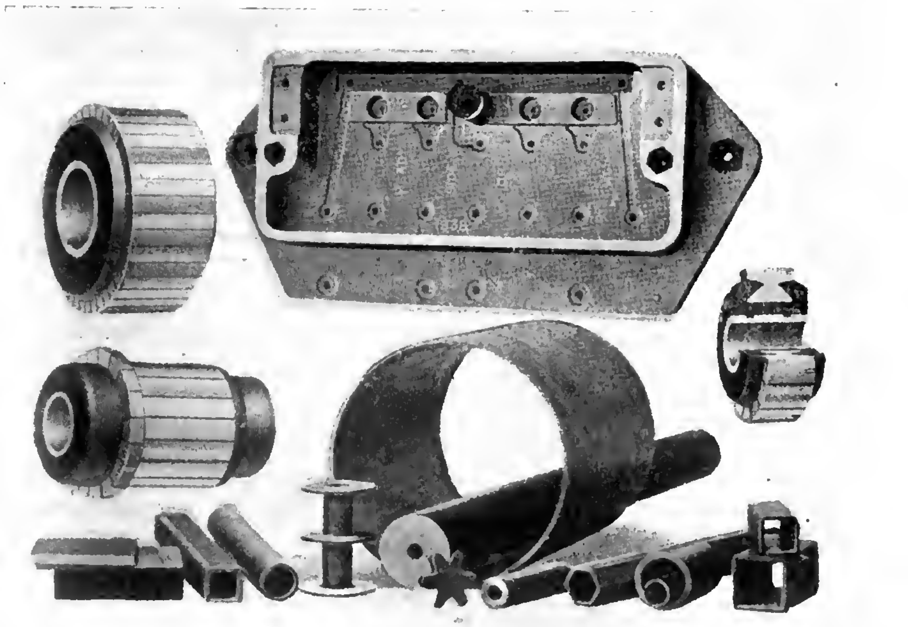
Die-Casting Advantages Obtainable

All the desirable features of die-casting are obtainable with this process, the principal differences being that bakelite is lighter — about one-third the weight—it is perfectly homogeneous, does not lose its mechanical strength nor deteriorate with age, is unaffected by most liquids and vapors, and has a finish of any desired fineness which is permanent in any climate, dispensing with enamelling, plating, or any other method of surface coating.

Commutators for electrical apparatus are now assembled in position and the bakelite moulded into place along with bushings, and any other desired parts. The cost of small and medium sized commutators is thus largely reduced through the elimination of mica in any shape or form. A bakelite molded commutator is impervious to oils and dust; and cannot work loose in service. Armature coils impregnated with bakelite are bound together in a solid mass of high electrical insulation, and entirely unaffected by water, heat, etc. Apparatus so treated may be operated at higher temperatures and run at great speed without distortion.

Diversity of Applications

Goods of many kinds may be made, from electrical instrument covers, switch fittings, terminal blocks, etc., to automobile radiator caps and steering wheel rims, while articles such as transparent fountain pens, pipe stems, cane handles, cigar holders, buttons, etc., serve to indicate the more ornamental applications.



ELECTRICAL, MECHANICAL AND MISCELLANEOUS PARTS MOULDED IN BAKELITE.
Switch boxes are moulded with metal terminal posts in position; commutators are moulded in one piece, dispensing with mica, and possessing great mechanical strength, while tubes, bars and stock shapes are obtainable in great variety.

While the completeness of the manner in which it displaces hard rubber will be understood from the foregoing remarks, it has remained for mechanical applications to offer what promises to be a wide field of application. In the form of sheets, rods, tubes, etc., it is fast taking the place of hard rubber, fibre, press board and similar materials.

Mechanical Uses Numerous

Gear pinions made of bakelite are as near perfection as possible. This is due

to the fact that bakelite is a non-organic substance, and does not deteriorate with age, swell, warp or otherwise betray its organic origin like rawhide, fibre, etc. When cloth or paper is impregnated with bakelite and moulded under heat and pressure, the resultant product is a chemically different substance from the originals, the base materials assuming all the properties of the bakelite.

Pump valves, ammonia valves, valve wheels, switch handles, thrust bearings, oiless bushings, gear pinions, small machine parts previously die-cast, friction blocks and discs, etc., are a few applications which indicate the sphere of usefulness which this material is destined to fill in the near future. In addition to molded articles, it is obtainable in the form of sheets, rods and tubes of standard sizes which can be readily machined when required. The two principal colors are brown and black, but beautiful colors and stratified effects can be produced in connection with fancy goods and ornamental articles such as have hitherto been made of celluloid, xylonite, and similar fragile or inflammable materials.

Designers in many lines of manufacturing are daily becoming more aware of the value of bakelite in solving certain construction problems, the real usefulness of this new and unique material being due to its remarkable combination of qualities, which, previous to the advent of bakelite, were distributed amongst several different substances, but now for the first time are obtainable in a combined form capable of meeting all demands.

ELECTRIC STEEL

SOME statistics which have been recently issued show that the electric furnace is making steady headway. It is stated that the total number of furnaces now employed for steel making and in service has increased to over 300, and it is a significant fact, that recent progress in England has proceeded by greater strides than in any other country. Even in Sheffield, where a few years ago it was imagined that local conditions would preclude anything like an extensive employment of electric furnaces, a considerable number have now been installed.

Special Steels Feature

It is the increasing demand for special steels which has led to this increasing use of the electric furnace by Sheffield steel makers. For motor car construction and for aeroplane parts the need for special varieties of steel has increased very rapidly since the outbreak of war, and it has been found by experience that these steels can be best produced in the electric furnace. No fewer than fifteen furnaces have been put in operation in Sheffield during the past twelve months.

Furnace Types

The type of furnace most commonly employed is the arc type, mainly of the Heroult form, and those now in service vary in capacity from 3 to 10 tons. It is reported that Hadfields have already five such furnaces at work, while Vickers, John Brown & Co., and Thomas Firth & Sons have each two in operation, and Arthur Balfour & Co., Samuel Osborne & Co., and the metallurgical department of the University one each. The demand for special steels for motor car manufacture has induced some of the leading motor manufacturers—including the Daimler Co.—to instal an electric furnace in their own works, and this is a tendency which is likely to increase. Whereas in England, as already indicated, the electric furnace has been mainly employed for the production of special steels, in the United States electric melting has been largely employed for the production of ordinary steels, although, of course, alloy steels are included in the output.

World Statistics

Turning to world statistics, it appears that the number of furnaces working in the United States, which was 30 at the end of 1914, has now increased to a total of over 70, so that America has displaced Germany, which has about 50 in service, from first place in the list. It should be pointed out also that many of the Germany furnaces are now being employed for the production of ferromanganese. The Heroult furnace is that most favored by steel-makers — more than one-third of the total being of this type, the number of induction furnaces being less than 40.

WAR EXPENDITURES STIMULATING CANADIAN INDUSTRIES

THE expenditure for war purposes in Canada during the current calendar year will aggregate $600,000,000 according to the Canadian Bank of Commerce. In its monthly commercial letter for March, the bank says:

"At the close of 1915, the total orders placed by the British Government in Canada for ammunition was $303,000,000, on which up to the end of the year $80,000,000 had been paid out. Orders on a large scale for other requirements of the Allies are in course of execution. To this volume of business will be added that arising from the equipment of the forces in process of enlistment in all parts of the Dominion, to provide for which Parliament has voted a credit of $250,000,000.

"On our own account and that of the Allies, if the war continues, the expenditure for war purposes in Canada will aggregate $600,000,000 within the present calendar year. The output of ammunition, which at the commencement of the present year was valued at $30,000,000 per month, is steadily increasing as a result of greater efficiency. That still heavier demands will be made upon our industries is foreshadowed by the announcement that at the request of the Government the banks are preparing to provide a further credit of from fifty to seventy-five millions for Imperial purposes. It is hoped that this will result in bringing new orders of at least $150,000,000 to this country.

"Expenditure on an unprecedented scale cannot fail to sustain the prevailing business activity while it continues. The profits of our fields and industries will in the meantime constitute a material set-off against our indebtedness, but we shall still have to provide for our increased annual obligations, and the as yet unforeseen and indeterminable conditions which will prevail when the war comes to an end."

U. S. STEEL AND CANADA

THE report that the United States Steel Corporation was about to make a large appropriation for the building of a plant on its Canadian property is again revived. It has cropped up from time to time for a good many years back, and when the steel business was looking rather ragged, it was a bogey of some influence on the nerves of the Canadian steel stocks.

Just now, with the Canadian mills operating to capacity and turning away business, the prospect can be viewed philosophically and time taken to decide whether this report of early construction is to pass into oblivion like the others.

The plausible side to the story this time is that with the talk now current in London of closer trade relations between the Mother Country and the Colonies after the war, the U.S. Steel Corporation may consider that the psychological moment to enter Canada has arrived.

Metallic zirconium and its alloys have recently been employed in metallurgy. The oxide is not reduced by the aluminum but ferro-zircon can be prepared by reducing the oxides of iron and zirconia together with powered aluminum, and have been used to a limited extent in place of ferro-titanium for the purification of steels. Zirconium is also claimed to be excellent as a deoxidizer of copper and its alloys, but this has not been proved.

CONTEMPORARY WAR ARTICLES

Embracing Information and Data Drawn from a Variety of Sources Relative to and Arising from the Prosecution of this Many-Sided European War

75 mm. H.E. SHELL PRODUCTION IN FRANCE

THERE are two principal methods of making shell cases in France, the first consisting of forging so as to obtain roughly the necessary shape, afterwards finishing by machine; and the second that of turning from the rough solid bar. For some shells, cast steel is used, but, generally speaking, a

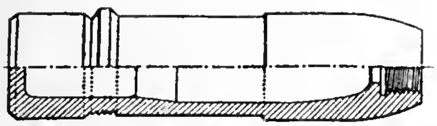


FIG. 1. FRENCH 75 MM. HIGH-EXPLOSIVE SHELL.

moderately hard acid Martin steel is used having the following characteristics:—

	Breaking load tons per sq. in.
In annealed condition ...	35 to 40
After quenching in water at 64.6 degs. F., and retreating at 977 degs. F.	54 to 67

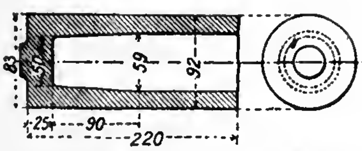


FIG. 2. BLANK AFTER PUNCHING.

The 75 mm. shell cases are made from bars which are 82 mm. in diameter, the length cut off for each shell to be forged being 195 mm., and for each bored shell 310 mm., or perhaps a little more.

The relative merits of the forging and boring are discussed in, as will be noted, no uncertain terms. The former is declared to be much more advantageous than the latter from all points of view, and particularly as regards output, quality and economy. It is pointed out

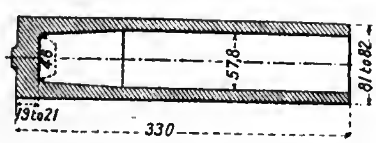


FIG. 3. BLANK AFTER DRAWING.

FIG. 4. CENTERING.

too that the weight of a blank used for forging is just under $17\frac{1}{2}$ lbs. as compared with the weight of just over $27\frac{1}{2}$ lbs. in the blank to be bored, and that the whole of the difference in weight is lost in turnings.

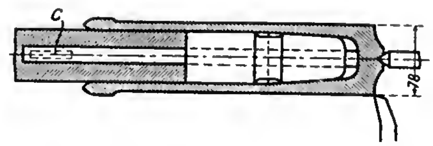


FIG. 5. TURNING.

The forging process, however, requires the installation of heavy hydraulic machinery such as, at the beginning of the war was possessed by comparatively few French shops. However, the necessary presses, etc., are being quickly made and put into service, and it is said that in quite a short time they will be operating in sufficient numbers to permit the abandonment of the boring method, which it is stated "has never been considered as being anything but a provisional solution of the problem." Both methods as they are carried out in France are, however, briefly described here.

The Forging Process

The forging process comprises two operations—punching and drawing. For the punching operations the 75 mm. blank is 195 mm., or roughly $7\frac{5}{8}$ in. long, and 82 mm., say $3\frac{1}{4}$ in., in diameter. It is heated in a furnace to a temperature of between 1,000 and 1,050 deg. Cent. It is then taken out and, after

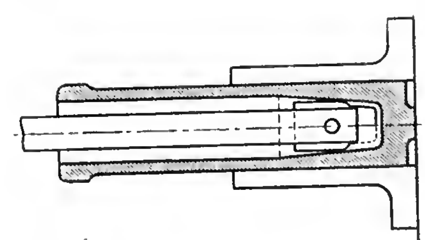


FIG. 6. SMOOTHING BOTTOM OF HOLE.

being carefully brushed to remove the scale, is inserted while hot vertically into a matrix arranged in the base of a vertical hydraulic press. The matrix is slightly tapered from top to bottom, and is rather larger in its smallest diameter than the blank. When the blank is in the matrix, a cylindrical plunger which is attached to the piston of the press is immediately forced down on to its centre. The plunger has a diameter in its largest part of 59 mm., and is parallel for the major portion of its length, but in the last 90 mm.—that is in the portion which is pressed on to the blank—it tapers down to a diameter of 50 mm.

The first result of the application of pressure is to make the metal spread out and completely fill the matrix, and on the pressure being continued the metal is squeezed out in annular form around

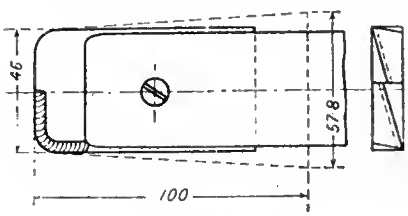


FIG. 7. SMOOTHING TOOL.

the plunger, so that, when the stroke of the press is completed, the blank has assumed the shape and size shown in Fig. 2. It will be observed that the length has now become 220 mm., that the outside diameter varies from 92 mm., to 83 mm., and that there is a projection at the closed end, the object of which will be described later.

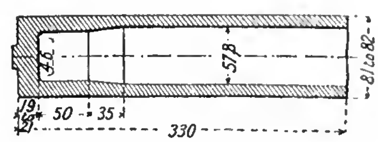


FIG. 8. ALTERNATIVE SHAPE OF HOLE.

As the thickness of the metal when the punching comes from the press is considerably in excess of that which is required in the finished article the process of drawing is resorted to so as to avoid an excessive amount of machining. In the drawing process, which is accomplished in the same heat as the punching, the punched blank is placed on the end of a horizontal plunger, which is considerably smaller in diameter than the punched hole. The plunger then

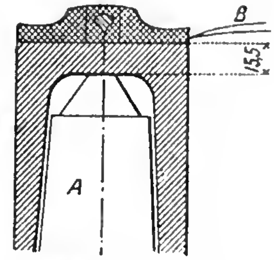


FIG. 9. MARKING OFF THICKNESS OF BASE.

forces the metal through one or preferably two dies, so that the half-finished shell case, as we may now call it, has

assumed the shape and size shown in Fig. 3.

It will be observed that it is now accurately cylindrical, that the diameter

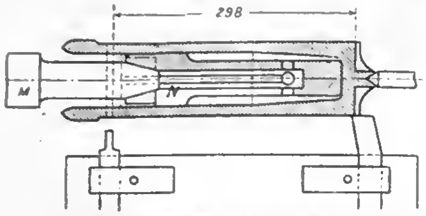


FIG. 10. MACHINING BASE AND CUTTING TO CORRECT LENGTH.

has been reduced to from 81 mm. to 82 mm., and that the length has increased from 220 mm. to 330 mm. The central hole has also been reduced in diameter. With careful working, it is explained, this central hole may be made so exactly to gauge in the drawing press that it may even sometimes be allowed to go without any machining or, at any rate, all it should require is a slight milling at the bottom. The drawing press may be either hydraulically or mechanically worked. At Creusot the work is partly done by electrically operated presses,

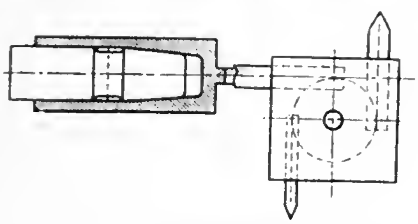


FIG. 11. RE-CENTERING.

which, apparently, are operating most satisfactorily.

The Boring Method

If the boring method be employed, the first process is to cut the blanks to the correct length. This, of course, may be done in several ways, and in one works the oxy-acetylene flame is being employed successfully, the 82 mm. bar being cut off in thirty seconds. The next operation is to mark on one end the correct axis of the blank. The other end is then polished and treated with an iodide solution so as to discover any porosity or defect in the metal.

Next a central hole 46 mm. in diameter is bored in a horizontal boring machine for a depth of 268 mm., which leaves the base with a thickness of about 27 mm. This, with the addition of some 15 mm. for the projection to be used for a centre makes up the total of 310 mm. mentioned above as being the length of the original blank. A conical hole 7 mm. in maximum diameter is then bored in the centre of this projection, the operation being shown in Fig. 4, after which the shell is mounted on a mandril chuck, as shown in Fig. 5, and a cut is taken off along the length of the case, so as to reduce its diameter to slightly more than it is to be in the finished shell to about 78 mm.—see Fig. 5. The edges at the end are also chamfered off.

The succeeding operation is the smoothing of the bottom of the hole. This is done as shown in Fig. 6, a special tool such as that shown in Fig. 7 being employed. Occasionally the interior of the cases is formed as shown in Fig. 8, instead of as in Fig. 3, that is with two parallel portions connected by a conical portion. In this case the whole of the interior may be machined at one operation with three tools. One firm uses for this purpose a Potter turret lathe, which operates automatically. A mark is then

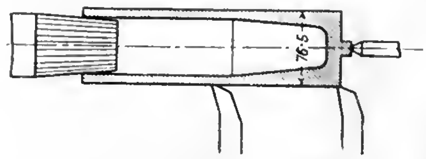


FIG. 12. REDUCING DIAMETER.

scribed on the outside of the case at the base or closed end, to indicate where the metal must be cut off in order to leave a thickness of 15.5 mm. This is done, as is shown in Fig. 9 by means of a gauge spindle A and a scriber B. Following this, an internal spindle chuck M with an expanding arrangement N is inserted into the case, see Fig. 10, so that the latter may be mounted in a lathe to be cut exactly to length by two tools, one a parting tool and the other a tool which will remove the surplus thickness at the base, only a projection for the centre being allowed to remain.

In the next operation, the length of this projection is reduced, as shown in Fig. 11, and a fresh centre hole made. Another cut is then taken along the length of the case, as shown in Fig. 12, the diameter being reduced to 76.5 mm. Thereafter the processes followed are the same, no matter by what method the shell was originally formed.

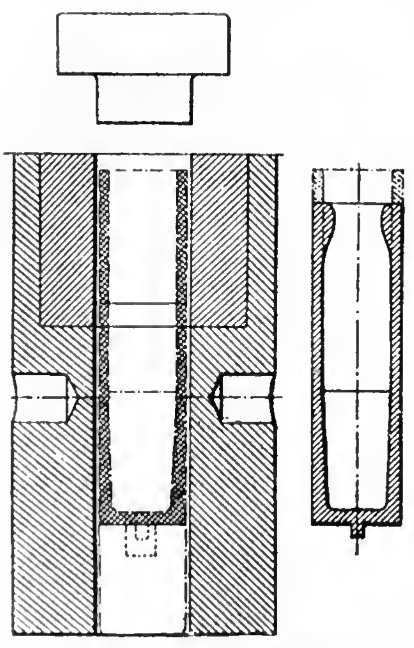


FIG. 13. SETTING UP EDGES ROUND MOUTH OF CASE.

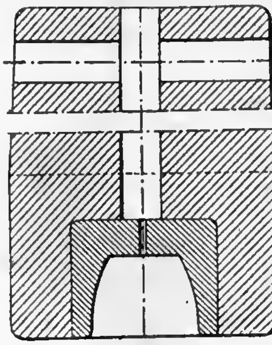


FIG. 14. MATRIX FOR FORMING OGIVAL HEAD.

Succeeding Operations

Up to this point, the shell case has remained cylindrical. It now has to be given an ogival head. This can be done in two ways, but in both of them it is necessary to thicken or set up the edges of the metal round the mouth of the case. For this purpose the open end of the case is inserted into a special type of furnace provided with round holes just large enough to admit it. When a temperature of some 900 deg. Cent.—1652 Fah. is reached, the case is taken out and dropped, base downwards, into a matrix as shown in Fig. 13, and a plunger made to descend on to the heated metal. Since the case fits the matrix quite tightly, the pressure exerted causes the metal to bulge inwards, as shown in the right-hand view, the length of the case being, of course, correspondingly lessened during the process.

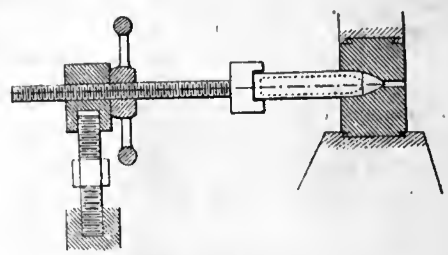


FIG. 15. FORMING OGIVAL HEAD WITH POWER HAMMER.

The case is then ready to be given its conical end, and to do this the open end is heated in a furnace very similar to that employed in the preceding process, and then either inserted into a recess in the base of an hydraulic press, so that the heated end may be subjected to pressure by the descending ram, which is furnished with a matrix shaped like that shown in Fig. 14, or the required form is brought about by means of a power hammer. In the latter case the arrangements are as shown diagrammatically in Fig. 15. There are two half matrices, one being mounted on the anvil and the other being carried by the

tup. The shell case with its heated end is mounted in a chuck fixed to the end of an adjustable horizontal screw, by means of which it can be rotated and gradually be advanced further and further into the jaws of the matrix as the hammer delivers its blows.

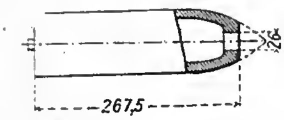


FIG. 16. PART SECTION SHOWING HOLE BORED IN HEAD.

It is necessary to confine the length of case heated for the process of forming the head between fairly narrow limits, so that the minimum number of rejections may be experienced. When using a press the length heated should only be from 50 mm. to 60 mm., but when using a power hammer this length has to be increased to between 80 mm. and 90 mm. The process of forming the ogive is rather a delicate one, but if all the arrangements are well planned few failures should occur. Indeed, there should certainly not be more than 1 per cent.

As regards the relative merits of the two methods of forming the nose, it is pointed out that both have their advantages and their disadvantages, and the choice as to which is to be used must depend largely upon attendant circumstances. It is said, however, that with the press there is a greater output in a given time than with the hammer.

Heat Treatment

After these processes the pointed end —if there be one—is removed, and a hole bored through the metal into the interior of the cavity, as shown in Fig. 16. The cases are then ready for heat treatment. For this purpose it is not unusual to employ a gas furnace such as that shown in Fig. 17, though other kinds of furnaces may, of course, be used. The temperature to which the cases are raised is about 850 deg. Cent. or 1,562 deg. Fah., and when they are removed from the furnace they are allowed to remain in the air for a few seconds, so as to permit the temperature to fall some 50 deg. Cent. They are then quenched in a special bath in which first of all the liquid is squirted at both

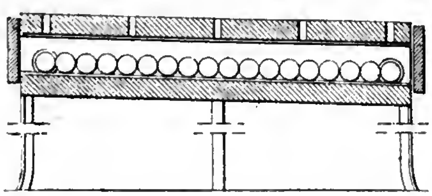


FIG. 17. GAS FURNACE FOR HEAT TREATMENT.

the inside and the outside of the case, and are then totally immersed, the temperature of the liquid being about 20 deg. Cent. or 68 deg. Fah. The re-treatment is carried out at a temperature of between 500 deg. Cent. and 550 deg. Cent., or 932 to 1,022 deg. Fah. The hardness aimed at is such that a 10 mm. —just over 3/8 in. Brinell ball acting under a total pressure of 3,000 kilos.—just under three tons, will make an imprint between 3.5 mm. and 3.7 mm., or practically 1/8 in. wide. Every case is subjected to this test, and all those which are too hard are re-treated.

Centre of Gravity

The operations carried out subsequent to the heat treatment are not always

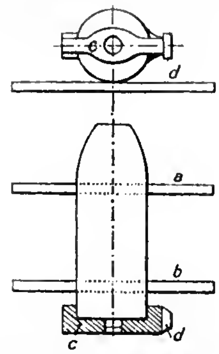


FIG. 18. TESTING CENTRE OF GRAVITY.

made in the same order, but that indicated, may be taken as being more or less normal. First of all it is necessary to ascertain whether the centre of gravity of the case falls within the required limits transversely. This is done by specially skilled workmen, who place the case on two parallel straight edges, a and b—see Fig. 18. If there are signs that the case is heavier on one side than the other a cap c is fitted on the end of the case, this cap being provided with a small counterpoise d, which is of such weight that it will accurately counterbalance the largest permissible displacement of the centre of gravity — which is 0.5 mm. If the case then rolls accurately on the straight edges, or if it comes to rest with the counterpoise lowest, then the limits of tolerance have not been exceeded.

If it does not do so, then it is necessary to ascertain by how much the limits have been exceeded. This is done by the aid of the special balance shown in Fig. 19. The case A is placed on the scale of the balance in such a manner that the bias of its weight is in the vertical plane and equilibrium obtained by moving the cursor C along the rack B until the pointer F is brought to the zero mark. The case is then turned through a right angle, and this, of course, upsets the equilibrium, which may be re-established by running the cursor E along the rack D.

These operations should be carried out before any further machining is done, so that any correction necessary may be effected during it. As a matter of fact, the correction is frequently made in the two next operations, which are the giving of the aperture in the nose a touch with a countersinking bit, and the reforming of the centre hole in the projection at the base. By slightly altering the position of the latter the centre of gravity may be readjusted. The outside of the cylindrical part of the case is next finished off to correct diameter in two operations, one fine cut and a still finer cut being taken. For this purpose an ordinary lathe with a carriage capable of taking four tools, as shown diagrammatically in Fig. 20, is employed.

The thickness of the base is now gauged, and if necessary a shaving taken off it. As will be remembered, it was left 15.5 mm. thick. The minimum thickness allowed is apparently 14.5 mm. The channel for the driving band is then cut and smoothed, and its rear edge chamfered off. Circular ridges are then formed in this groove, and by the aid of one or more knurling tools these ridges are moulded into numerous diamond-shaped projections, which take the place of the waved grooves in the British shells for preventing the band from turning.

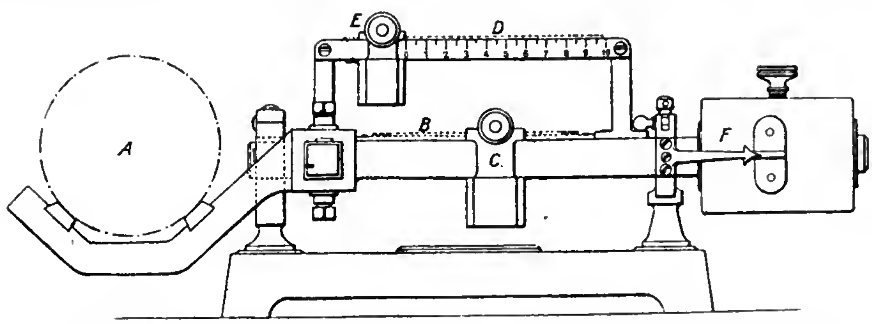


FIG. 19. SCALE FOR ASCERTAINING VARIATION IN CENTRE OF GRAVITY.

Final Operations

The proper ogival curve is next given to the nose by means of a lathe provided with a former, and at the same time the swelled portions behind the nose and behind the driving band are brought accurately to standard diameter. After this the fuse aperture is bored to two diameters, as shown in Fig. 21, and a channel is formed between them. This work is divided up into five distinct operations. The aperture is then screwed to receive the screw plug. Finally the projection at the base, which has served as a centre during the pre-

ceding operations, is removed, great care being taken in doing so not to interfere with the thickness of the material of the base, which has been already brought to standard.

These operations completed, the shell case is submitted to a test to verify the correctness of its centre of gravity longitudinally, and is weighed. The first process consists in gently placing the shell in correct position on two knife edges arranged 5 mm. apart. If the displacement of the centre of gravity is within the tolerated limits the case remains balanced on these edges; if not it is sent back to be readjusted. The case is then weighed, and if too light it is rejected. If too heavy it is returned to have the necessary weight removed.

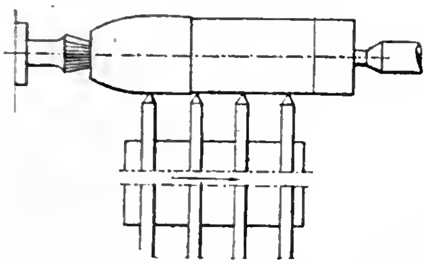


FIG. 20. FINISHING TO CORRECT OUTSIDE FORM.

Every shell case, without exception, is afterwards submitted to an internal hydraulic test of 1,400 kilos. per square centimetre, say nine tons per square inch, for ten seconds. The base, which has previously been well polished, it carefully examined with a magnifying glass during the test, and there must be no trace of sweating. The permanent enlargement in the diameter of the shell case when the test pressure is taken off must not exceed 0.1 mm.

After the hydraulic test, the copper band is fitted, this being generally done by the aid of an hydraulic press, and in three operations:—

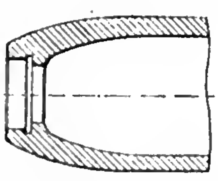


FIG. 21. SECTION SHOWING FUSE APERTURE.

1.—Forcing the band into its groove by squeezing it between to half matrices.

2.—Forcing a channelled ring over it. and forcing a smooth ring over it.

Sound Test

The ring is then machined in two operations. the results of which are shown in Figs. 22 and 23. It should be mentioned that, before the bands are put on, all the shell cases are submitted by the military authorities to a sound test, and any one which does not give out a correct ringing note is rejected. The tooling of the band completed, a plate of copper, or preferably of tinned iron, is soldered to the base, so as to make certain that any porous place which has not become evident during the tests is effectively covered up. Finally the shell has stamped on it various data, including the places of manufacture and tempering of the steel, the number of its batch, and its proof pressure.

After every operation in the course of manufacture, each shell case is carefully gauged, this course being necessary so that no unnecessary work may be done to any case which might be defective after any one operation. When completed. the perfect shell cases are arranged in groups of 1.000 or 2.000 for inspection of the military authorities, who choose at random a certain number generally about twenty, from each group. The cases chosen are then carefully tested for dimensions and centre of gravity. After being passed as correct, they are all washed in petroleum, sometimes greased inside. and the end then closed with a wooden stopper. They are then ready for dispatch to the place where they are charged. This may either be carried out in special works, at the various arsenals, or even in some cases at the rear of the army using the shells.

FIG. 22. FIG. 23.

The foregoing article is from the columns of our British contemporary. "The Engineer," and embodies the substance of a much more comprehensive description of high explosive shell manufacture in France which appeared in the French Journal "Le Geni Civil," a few months ago.

SHELL VARNISHING TROUBLE AND ITS CURE.

A MEMBER of our staff, says Alfred Herbert Ltd., in their Monthly Review, who was recently starting up a number of turret lathes in a large munition factory was discussing with the works manager the question of shell rejections and their causes. In the course of conversation he was told that trouble had been experienced with the varnishing of 18-pounder shells. After these had been in the drying oven some of them came out with the varnish unaffected in colour and transparency, whilst on others the varnish had become very dark in colour and opaque. These latter were being rejected, necessitating the removal of the spoilt varnish, a very tedious process, and subsequent re-varnishing. A visit was paid to the drying room, in order that the matter might be further investigated, as it seemed difficult to imagine what could cause some shells to come from the drying operation in a different condition to others which had undergone an exactly similar process.

The shells were loaded on to a truck, carying several tiers of compartments, and were supported in a vertical position. They were quite close together, so that when the truck was loaded up, it represented an almost solid mass of metal. It was then wheeled bodily into the stove, and the shells left there for the varnish to harden. Our representative did not have time to actually see the process caried out, but was informed that the shells from the middle of the truck were always affected in the manner above described, those on the outside coming out alright.

After thinking the matter over, he came to the conclusion that the trouble was due to a want of sufficient air space between the shells, this having the effect of causing the varnish to be changed in colour by the action of the heat. He, therefore, suggested that only half the number of shells be placed in the truck, having every alternate compartment blank. Since doing this the varnish trouble has been entirely eliminated. It would, however, be interesting to know if any of our readers have ever experienced similar difficulty with varnish, and if so, whether it has been overcome in a similar way.

Another little difficulty that crops up in the varnishing of shell interiors is how to prevent varnish from getting into the threads at the mouth of the shells. It is usual to screw a bush into the shell mouth for the purpose; but this does not entirely obviate the trouble, as varnish gets into the bottom thread or two, necessitating the use of a hand tap to remove it after the varnish has dried.

A wrinkle adopted by a Coventry firm may prove of use to others. The men who screw the bushes into the mouth first daub a small quantity of a vaseline-like mixture of beeswax and tallow round the bottom threads. The shells are then warmed and the mixture softens, running round the junction of the bush and the shell. The varnish forms an even coating in the warmed shell, while the beeswax-tallow mixture effectually prevents it from entry to the threads. The mixture is in no way detrimental either to the varnish or to the explosive which is put in later. No effort is made therefore to remove it after varnishing.

Sidney, N.S.—At the deferred annual meeting of the Board of Trade, held recently, the following officers were elected: President, C. P. Moore; first vice-president, Rod. McDonald; second vice-president. V. W. Merchant.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

SPECIAL AND MANUFACTURING FURNACES

THE necessity for correctly heat-treating dies, tools, cutters, etc., has been long recognized by toolmakers and skilled workmen, and within recent years the desirability of extending such treatment to many kinds of manufactured products has become strongly apparent in various lines of manufacture. The Stewart line of furnaces built by the Chicago Flexible Shaft Co., Chicago, has been developed to meet all requirements of forge, tool room, or manufacturing work, and a variety of designs and sizes is offered.

The special combination furnace shown in Fig. 1, consists of a crucible section in the centre with a forge section on the right, and a muffle section on the left which can be used as an oven when required. The crucible section is especially adapted for lead or cyanide hardening, oil tempering, melting soft metals, etc., and is arranged with a cylindrical combustion chamber into which the flame is projected at an angle so that it imparts a circular motion to the gases around the crucible, and maintains an even heat in all parts of the chamber,

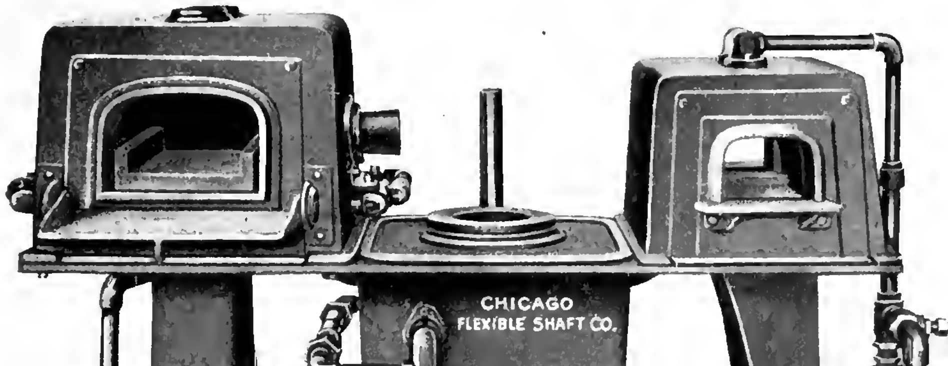


FIG. 1. SPECIAL COMBINATION FURNACE, INCLUDING OVEN, CRUCIBLE, AND FORGE SECTIONS.

the products of combustion escaping through a vent in the rear.

The forge section is open right through so that bars may be heated on any part of their length. The flame is projected down from the two burners and is under

FIG. 2. NO. 1 OVEN FURNACE WITH U-SHAPED BOTTOM SLAB.

perfect control. Tool dressing, light forging, and a great variety of work where direct contact with the flame is not a disadvantage, can be performed in this section.

The muffle section is used when the products of combustion must be kept from the work as when heating finished

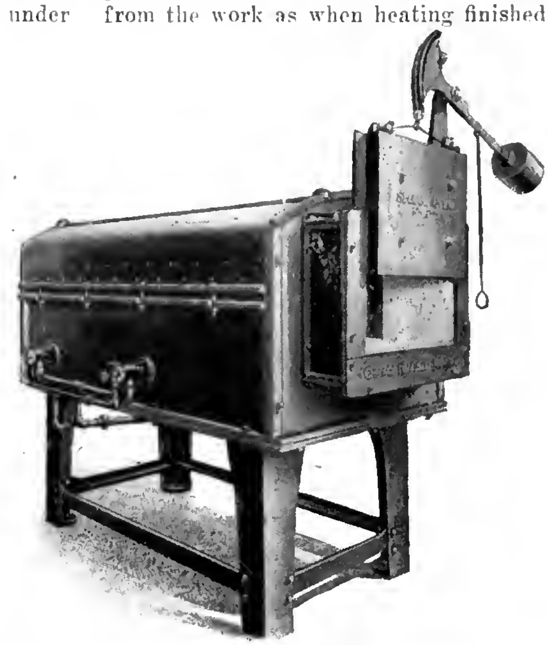


FIG. 3. NO. 25 CASE HARDENING AND ANNEALING FURNACE.

dies, cutters, etc. For ordinary hardening, or annealing, the muffle is removed and a U-shaped slab inserted, thus converting the furnace to the regular oven type. The opening of the muffle section is 4 in. high in centre, 7⅝ in. wide, 13¼ in. deep. The forge section is 4 in. high, 5¼ in. wide, and 10¼ in. deep, and the crucible is of pressed steel with a diameter of 6 in. at the top and a depth of 12 inches.

Approximate gas consumption per hour: Muffle section, 90 cubic ft.; crucible section, 70 cubic ft.; forge section, 60 cubic ft. The net weight is 1,500 lbs., and floor space is 4 ft. x 3 ft. 6 in.

The furnace illustrated in Fig. 2 is No. 1 Oven Furnace, and is particularly suited for all ordinary hardening purposes. A V-shaped bottom slab, with sides which project 1½ in. upwards, gives a semi-muffle effect, keeping the flames off the work, and giving a livelier heat than a muffle without the expense of replacements. Fire clay linings, 4 in. thick, are provided, and when so ordered, this furnace can be arranged for high-speed steel. The chamber is 5 in. high, 9 in. wide, and 13½ in. deep. Net weight 950 lbs., and floor space 28 in. square.

Special Oven No. 25 is specially adapted for case hardening, annealing, and similar work where quantity production demands economical equipment. The hearth is 22 in. wide x 60 in. long, with a door opening 14 in. high, net weight 6,700 lbs.

All Stewart furnaces are supplied with burners for use with artificial gas, but can be fitted for using natural gas, producer gas, or oil as desired.

THE "GEORGE" AUTOMATIC ROLLER BEARING.

AUTOMATIC ROLLER BEARING

A COMBINED roller and ball bearing, in which the radial load is taken by tapered rollers, and the end thrust by balls, is now being produced by the George Automatic Roller Bearing Co., Cincinatti, O. The idea of tapered rollers is not new, but the manner of combining the rollers and balls is new, the result of the construction being that rollers with an appreciable variation in size may be used, and they will adjust themselves so as to distribute the load equally on large and small rollers, the adjustment being automatically brought about by means of balls located between the ends of the rollers.

It is claimed for this bearing that in mounting great accuracy in machining is unnecessary. As will be noticed in the sectional drawing, the inner and outer surfaces of the bearing are tapered, hence concentricity is obtained by moving the bearing laterally in the housing. Both ends of the rollers are ground to a concave form, of slightly larger radius than the corresponding ball. When the bearings are tightened in place a wedging action occurs on the rollers, so that by the time the bearing has made a half turn, any rollers which may happen to be a trifle large are forced endways, causing the balls at that end to spread and act upon the ends of such rollers as may be slightly under size. These smaller rollers are thus forced back toward the smaller end of the bearing until they make proper contact with the working surfaces. Both rows of balls act as spacers, while the row of larger balls also acts as a thrust bearing to counteract the tendency of the rolls to creep laterally.

The bearing is easily assembled and disassembled by means of a small slot in the periphery of the large race which allow the last ball to be put in place when assembling, or taken out when disassembling. When in normal working position the slot does not interfere with the action of the balls.

The makers state that they are prepared to furnish bearings to fit parallel holes, interchangeable with the long series type of other roller bearings.

NOSING SHELLS.

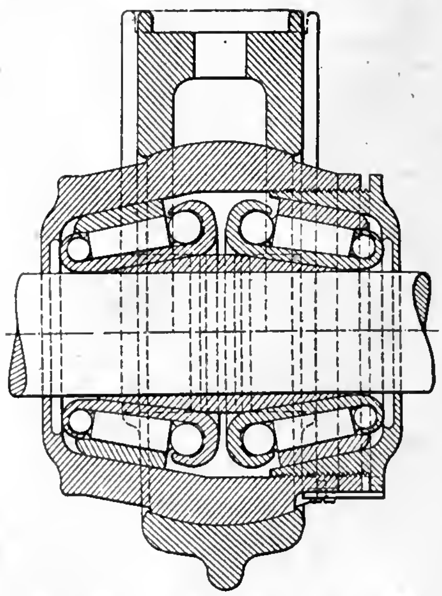
THOSE firms who are manufacturing the bottled type of shell, in which the nose has to be closed in after boring, may have experienced trouble with the upper closing die of the press picking up the shell on the up stroke of the ram It is then necessary to hammer the shell sides to release it, thus taking up valuable time and retarding production.

If a small handful of coal dust or wet sawdust be thrown inside the heated shell before the die is brought down, the gas or steam which is generated inside the shell forces it off the upper die without any external assistance. This wrinkle has been found eminently satisfactory.

It is, of course, obvious that any other medium can be adopted as alternatives to wet sawdust or coaldust provided it will generate some sort of gas or steam under pressure through the action of heat.

SHELL MANUFACTURERS AND ENLISTMENT.

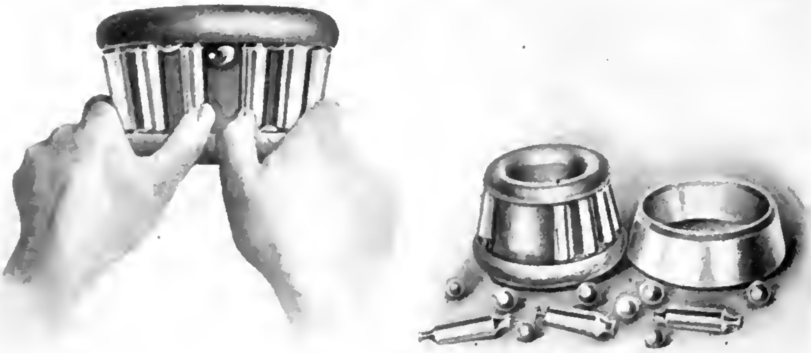
RESOLUTIONS were passed at a recent meeting of shell manufacturers and munition makers in the office of the Canadian Manufacturers' Association, expressing the belief that the work of manufacturing war munitions was being interfered with more and more each week, until there was an apparent danger that a shortage of war supplies for shipment abroad would result unless some plan is adopted to prevent the enlistment of men whose services in the factories are of vital importance.



SECTION OF LINE SHAFT BEARING.

It was voted to send copies of the resolution to the Minister of Militia and Defence, also to members of the Dominion Parliament and the Legislatures of the various provinces, with a request for some action to meet the necessities arising from the conditions.

The resolution calls for a registration of the men skilled in the making of shells and other munitions, so that they may be exempt from enlisting.



SEPARATING THE ROLLERS SO THAT THE FIRST BALL DROPS OUT, AND SHOWING BEARINGS DISASSEMBLED.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.
H. C. FOGARTY.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. MARCH 23, 1916 No. 12

INTER-EMPIRE TRADE

AS a result of her development as a manufacturing country, Canada, at the present moment, is probably the most highly favored of all the British Colonies with respect to future participation in inter-Empire trade. South Africa and Australia are so isolated geographically that their progress in manufacturing has heretofore been limited. In addition, the smallness of their home markets, the high cost of factory equipment, and the comparative scarcity of raw materials and fuel, have militated against their industrial upbuilding. There has, however, always been available to our manufacturers, all the materials and conditions necessary to the development of a manufacturing industry on permanent healthy lines.

Manufacturers throughout Canada are alive to the importance and desirability of securing a share of the Empire's requirements in manufactured products, commensurate with our now proven ability to produce. The present stages of development attained by the two colonies mentioned, closely parallel the state of Canadian development some years ago, when agricultural and allied interests overshadowed all other activity. There, as well as here, however, the war has stimulated home production in many lines to a degree which must not be overlooked by our people in the near future.

The President of the Johannesburg Chamber of Commerce, Ernest Chappell, recently said: "Generally speaking, the condition of affairs at present prevailing.... provides a strong stimulus to all South African manufacturers already established, and is giving them an impetus which cannot fail to be of the greatest service to them when they will again have to face competition from outside sources. It may fairly be stated that in this respect the war has constituted the finest assistance for our local manufacturers that they could possibly have had."

Such a statement from such an authority should receive careful attention by prospective exporters, not as a deterrent, but rather as an indication of future opportunities. For many years to come Canadian conditions will favor the production here of many articles, affording our manufacturers the opportunity of building their reputation on solid foundations. What these foundations consist of must be clearly recognized by us, even as they are beginning to be recognized by competitors abroad—"Uniformity of quality and regularity of production are conditions absolutely essential and fundamental to success in any manufacture"—and in no case we might add is the necessity more vital than in export work.

SHELL-MAKING IN CANADA OF PRE-WAR ORIGIN

IT may not be generally known that shell-making in Canada did not have its inception as a result of the outbreak of the present war. The latter, however, established it as a real industry, aside from its possible permanence as such. The fact that we have a Dominion Arsenal may likewise be news to many of our readers.

Some six years ago or thereabouts a shell-making department was organized at said Arsenal, and three years afterwards, according to the findings of Col. Sir. H. W. W. Barlow, following an investigation into the affairs of the institution as a whole, it was found that not a single shell had been produced which conformed to dimension requirements. The machinery for turning out shells was found to be in such poor condition that a considerable time would elapse before it could be put in shape again. Further, of the 8,000 shells in stock, the Barlow Commission recommended that such as were nearly correct to dimensions should be tested and salvaged if possible. On putting the recommendation into effect, not a single shell could be found that was properly shaped. The monetary loss as a result was estimated to amount to over $100,000. Evidently the Dominion Arsenal got off to a bad start and was dogged by the influences responsible for same right up to the time of its reorganization under the superintendence of Col. Lafferty.

The Arsenal activities since then have been many and varied, although related to munitions production in a wider sense, for in less than a year after the installation of the new regime, war broke out; the manufacture of shells then became a nation-wide affair with the outcome and progress of which all of us are more or less familiar. What this institution with its high sounding title of Arsenal made and had condemned in three years, our quite medium size and unpretentious machine shops turned out perfectly in about as many weeks, and undoubtedly at a lower cost per shell in spite of the fact that our metal-working plants have been reproached for accepting the earlier contracts at so-called fabulous prices.

As already stated, the activities of the Dominion Arsenal have been many and varied since the outbreak of the war, for while the widespread distribution of shell contracts has relieved that establishment of the necessity of carrying a proportionate share of these, much more responsibility has been thrown on its administration nevertheless. It would seem then that the Barlow Commission investigation and the resulting reorganization of the Arsenal administration, were timely, if not actually inspired, and it may not be too much to assume that our whole shell industry achievement had there its beginning in the dual role of a patriotic undertaking and a business enterprise worth while.

It might be stated that, in the "clean-up" referred to, and relative more particularly to small arms ammunition, while Woolwich standard gauges were understood to be employed in its manufacture, no trace of even one of such gauges was in evidence at the Arsenal. Millions of rounds of .303 cartridges, therefore, met the same fate as the shells of which we have written.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	
	Montreal.	**Toronto.**
Middlesboro, No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	2.75
Steel bars, 2 in. and larger, base	4.00
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	3.00
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	2.75
Small shapes	3.00
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	3.10
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$31 00	$30 50
Electrolytic copper	31 00	30 50
Castings, copper	30 00	30 00
Tin	52 00	56 00
Spelter	23 00	22 00
Lead	9 75	10 50
Antimony	48 00	48 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, ¼ to ½ in., lb.	$3 75	$3 50
Heads, per lb.	4 00	3 75
Tank plates, 3-16 in.	4 05	3 85

WROUGHT IRON PIPE

Prices in effect March 4, 1916

Buttweld

Per 100 feet	Black	Galv.
⅛ in.	$ 3 00	$ 3 75
¼ and ⅜ in.	2 76	4 59
½ in.	3 49	5 40
¾ in.	4 14	6 73
1 in.	6 12	9 95
1¼ in.	8 28	13 46
1½ in.	9 90	16 09
2 in.	13 32	21 65
2½ in.	21 06	34 22
3 in.	27 54	44 75
3½ in.	33 12	53 82
4 in.	39 24	63 77

Lapweld

	Black	Galv.
2 in.	14 80	23 13
2½ in.	21 65	34 81
3 in.	28 31	45 52
3½ in.	34 04	54 74
4 in.	40 33	64 86
4½ in.	50 80	79 38
5 in.	59 20	92 50
6 in.	76 80	120 00
7 in.	104 72	160 65
8 in. x 25 lbs. per ft.	110 00	168 75
8 in. x 28 lbs. per ft.	126 72	194 40
9 in.	151 80	232 88
10 in. x 32 lbs. per ft.	140 80	216 00
10 in. x 40 lbs. per ft.	181 28	278 10

Ontario list—All points from Kingston and west to, but not including Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
⅛ in.	$ 3 00	$ 3 75
¼ in. and ⅜ in.	2 70	4 53
½ in.	3 40	5 31
¾ in.	4 03	6 61
1 in.	5 95	9 78
1¼ in.	8 05	13 23
1½ in.	9 63	15 81
2 in.	12 95	21 28
2½ in.	20 48	33 64
3 in.	26 78	43 99
3½ in.	32 20	52 90
4 in.	38 15	62 68

Lapweld

	Black	Galv.
2 in.	14 43	22 76
2½ in.	21 06	34 22
3 in.	27 54	44 75
3½ in.	33 12	53 82
4 in.	39 24	63 77
4½ in.	49 53	78 11
5 in.	57 72	91 02
6 in.	74 88	118 08
7 in.	102 34	158 27
8 in. x 25 lbs. per ft.	107 50	166 25
8 in. x 28 lbs. per ft.	123 84	191 52
9 in.	148 35	229 43
10 in. x 32 lbs. per ft.	137 60	212 80
10 in. x 40 lbs. per ft.	177 16	273 98

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 75	$17 75
Copper, crucible	21 00	21 00
Copper, unch-bled, heavy	20 75	20 75
Copper wire, unch-bled	20 75	20 75
No. 1 machine compos'n	16 25	16 25
No. 1 compos'n turnings	14 50	14 00
New brass clippings	15 50	14 00
No. 1 brass turnings	11 25	11 25
Heavy melting steel	9 00	9 30
Boiler plate	11 75	14 00
Axles, steel	13.00	15.00
Axles, wrought iron	18.00	19.00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	10 50	9 00
Stove plate	9 50	8 50
No. 1 machin'y cast iron	14 75	13 00
No. 1 machin'y cast iron	14 75	14 00
Heavy lead	7 00	7 00
Tea lead	6 00	6 00
Scrap zinc	15 50	15 50
Aluminum	34 00	34 50

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	60
Stove bolts	72½
Plate washers	35
Machine bolts, ⅜ and less	52½
Machine bolts, 7-16 and over	42½
Blank bolts	42½
Bolt ends	42½
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12½
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hexagon, all sizes	2¾c per lb. off
Nuts, hexagon, all sizes	3c per lb. off
Copper rivets and burrs, list plus	15
Burrs only, list plus	30
Iron rivets	55
Boiler rivets, base, ¾-in. and larger	$4.35
Structural rivets, as above	4.10
Wood screws, flathead, bright	80 & 10
Wood screws, flathead, brass	50
Wood screws, flathead, bronze	40

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	66 00
Wire rods, Pittsburgh	55 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 45	$3 40
Cut nails	3 15	3 20
Miscellaneous wire nails	75 per cent.	
Pressed spikes, 5/8 diam., 100 lbs.	$3 75	

MISCELLANEOUS

Solder, guaranteed	0.31½
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.49
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	11.70
Red dry lead, 100-lb. kegs, per cwt.	11.50
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.79
Linseed oil, raw, single bbls.	1.02
Linseed oil, boiled, single bbls.	1.05
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	6.00
Lead wool, per lb.	0.12
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	55
Standard drills over 1½ in.	30
3-fluted drills to 1½ in.	30
3-fluted drills over 1½ in.	20
Bit stock	65
Ratchet drills	30
Machine bits for wood	30 and 5
S.S. drills for wood	55
Wood boring brace drills	40
Electricians	35
Sockets	55
Sleeves	55
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	10
Drills and countersinks	5
Bridge reamers	55
Centre reamers	15
Chucking reamers	15
Hand reamers	15 and 5

High speed drills and reamers are double the list price plus 20 per cent.

COLD ROLLED SHAFTING

At mill	10%
At warehouse	Net

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65 per cent.; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 72½; malleable, lipped unions, 65.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$3 75
Sheets, black, No. 10	4 35	4 35
Canada plates, dull, 52 sheets	4 00	4 00
Canada-Plates, all bright	6 30	5 50
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's Best, No. 28	7 50	7 50
Viking metal, No. 28	6 50	6 50
Colborne Crown, No. 28	6 75	6 75
Premier, No. 28, U.S.	6 75	6 90
Premier, 10¾ oz.	7 50	6 95

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.35
⅜ in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
⅝ in.	6.35
¾ in.	6.15
⅞ in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B B

⅛ in.	$14.00
3-16 in.	10.45
¼ in.	7.15
5-16 in.	5.65
⅜ in.	4.60
7-16 in.	4.60
½ in.	4.60
⅝ in.	4.45
¾ in.	4.45

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	72½
Kearney & Foot, Arcade	72½
J. Barton Smith, Eagle	72½
McClelland, Globe	72½
BlackDiamond	60-7½
Delta Files	72½
Nicholson	72½
Globe	72½
Vulcan	70-10
Disston	70

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	....
1¼ in.	19 55	....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	12 10
2¼ in.	26 60	13 30
2½ in.	29 00	15 95
3 in.	38 70	16 06
3½ in.	44 00	19 80
4 in.	49 50	25 30

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.23
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	.04¾
Lard oil, per gal.	1.28
Thread cutting oil	.54
Imperial quenching oil	.38
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.15¼
Peerless	.15¼
Grand	.14¼
X L C R	.13¼
Atlas	.13¼
X Empire	.12¼
X press	.11¼
COLORED.	
Lion	.09½
Standard	.08¾
No. 1	.08¾
Popular	.07¾
Keen	.06¾
WOOL PACKING.	
Arrow	.20
Axle	.15
Anvil	.11
Anchor	.09
WASHED WIPERS.	
Select White	.09
Mixed Colored	.07
Dark Colored	.06

This list subject to trade discount for quantity.

COPPER SHEETS

	Montreal	Toronto
Bars. ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 in.	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$13 00	$13 00
Sheets, 3½ lbs. sq. ft.	12 50	12 50
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 25

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.32 to .33
Tin	.48 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs, American	.03 to .04
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy	.35
Copper sulphate	.25
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., March 20, 1916.—The steel situation continues to be the outstanding feature of the week's market. It is felt that constant advances on top of the present heavy demand will exercise a retarding effect on certain domestic activities with the possibility of a temporary shut down in some cases. Ocean tonnage continues in an acute state with its attendant delays in transportation, but the opening of navigation is expected to afford some relief through the resumption of lake traffic.

Pig Iron

Despite the condition of the steel market, the situation in the pig iron field continues comparatively steady. The supply is sufficient to meet the steel requirements, although prices, like steel, continue to advance. General conditions are unchanged throughout the Canadian pig iron field and prices remain firm. A further advance of $50 is reported for prompt ferromanganese (f.o.b. seaboard), the present price being quoted at $400 per ton. Future importations are, however, listed at $175 on contract.

Steel

The situation continues to grow more acute as each week fails to bring any indication of relief, the ever-increasing demand for all classes of steel gradually bringing us to the stage of a runaway market. With the weekly advances quoted in steel prices the demand for material does not diminish, and prices on all steel can only be considered as nominal.

Pittsburg quotations on open-hearth, sheet bar billets show an advance of $1 a ton, being quoted at $45. Forging billets, Pittsburg, with an advance of $5, are now selling at $65 per ton. Montreal prices are unchanged, but dealers intimate that quotations may advance before next week. Iron bars, New York, are $3 higher, this week's price being 2,569. Steel bars are quoted at $2.75 Pittsburg, being an advance of $5 a ton. Montreal prices f.o.b. are now $60 a ton. Following the general advance of $3 to $5, boiler plates are now quoted at $3.75 for ¼ to ½-inch plates; $4 for heads, and $4.05 for 3-16-inch tank plates; this is an increase over last week of 35 cents a hundred. Structural shapes are 10c a hundred higher, and the demand is fairly heavy. A slight reduction is noted in the price of railroad spikes, which are 10c a hundred lower. Structural and boiler rivets have advanced $3 a ton, and are now bringing $3.15 and $3.25 respectively. The carload discount, Pittsburg, on cold rolled shafting is now 25 to 20 per cent. in place of 30 per cent. A heavy demand is reported for the principal grades of sheets, more especially for blue annealed and sheets for deep stampings. Automobile firms are using large quantities of special sheets. This, coupled with the continual advance of sheet bars, has resulted in a further advance on all grades of iron sheets. American prices have been advanced $1.50 a hundred on black and $2.50 on blue annealed. Montreal dealers have recently revised their lists, and are now quoting black sheets, No. 10 gauge, at $4.35; Canada dull, 52 sheets, $4; Apollo, 10¾ oz. galvanized, $7; Queen's head, 28 B.W.G., $7.50; Fleur-de-Lis, 28 B.W.G., $7.25; Gorbal's best, $7.50; Premier, No 28 U.S., $6.75, and 10¾ oz., $7.50. Viking metal is lower, and quoted at $6.50.

The continued rise on all steel products has again affected the price on seamless boiler tubes, and an advance of 10 per cent. is noted in this week's quotations. The increase brings the prices up to $19.55 for 1-inch, and $49.50 for 4-inch seamless tubes.

Metals

With the exception of tin and lead, the situation generally remains the same. Copper continues comparatively quiet, with a slight undertone of strength. Recent developments, following an apparent scarcity of tin, had the effect of advancing the price of that metal, but latest reports indicate an easier feeling. Foreign spelter markets have shown weakness with declining prices, but local dealers have held firm, and a steadier tone is believed to prevail abroad. The feature of the week has been the market in lead.

Copper.—Little improvement is reported in the copper situation, but the market appears somewhat stronger. According to advices from the London market, statistics show a reduction in the total visible supply of over 2,100 tons since the 1st of March. This, however,

following the increased supply of the latter part of February of nearly 1,300 tons, leaves a net decrease of about 800 tons. English traders seem a little sceptical as regards any copper famine in America, but there is little doubt that with present conditions prevailing for an extended period of time the British stock of copper will gradually become exhausted.

The recent weakness of the market here has had little effect upon prices, as consumers are well covered for their immediate needs, and the market is held comparatively firm by demands for future delivery. London quotations show an advance of £3½ on spot and £3 for futures. New York prices, which showed a weakness earlier in the week, are ¼c higher on lake and electrolytic, and ½c on castings. Quotations are 27¾c and 26¼c per pound. Local conditions are unchanged, with a tendency to take on strength. Prices quoted are 31c and 30c for lake and electrolytic and castings respectively.

Tin.—The irregular condition of the tin situation at present has placed the market in a somewhat unsettled state. For some time the spot prices for tin have been exceedingly high and futures comparatively low. The scarcity of metal and the British shipping regulations have influenced the New York market. In an effort to attract purchasers, dealers have gradually reduced quotations on spot tin until the price is now 4c less than the previous week.

In direct contrast to this, London quotations show an advance of £6 on spot and £2 on futures. New York prices are all nominal, ranging from 46½c April delivery to 42¾ October delivery. Spot 52c a pound. Local dealers report a strong and rising market, with an advance of 2c. Prices are nominal at 52c per pound.

Spelter.—Following the activity of the market, which was evident in the earlier part of the week, the situation has become quieter, but New York quotations show a slight advance over a recent decline. From these developments prices for futures and early metal have drawn closer together. This is largely due to consumers buying in advance. Dealers here report unchanged conditions, with quotations firm at 23c per pound.

Lead.—The market is very strong and quotations continue to advance. The Trust price remains 1c below the open market, to prevent any unreasonable advance. This action may not please the producer, but it would seem inadvisable at this time to elevate the market further. London reports a spot advance of £2 per ton and an advance of £1 18s. on futures. New York's quotations are 7c Trust, and an outside nominal price of 8⅛c per pound. This is an advance for the week of 4c and 1c respectively. Local dealers, following the lead of the foreign markets, are quoting 9¾c, being an advance of 1c per pound.

Antimony.—The general market remains unchanged, with slight improvement shown in futures. Dealers here report a quiet situation, with quotations firm at 48c per pound.

Aluminum.—Situation quiet and unchanged, with an easier feeling. Prices here firm at 68c.

Machine Tools and Supplies

Continued activity in the munition field is resulting in comparatively good business. Considerable improvement has been noted recently in increased inquiry for 4.5 and larger equipment. Machine tool builders in the States are experiencing considerable inconvenience owing to the shortage of labor; and this factor is expected to become emphasized as the weather improves. What the 1st of May will bring is at present an unknown quantity; but it is anticipated that further handicap will be placed upon production in many branches of metal working activities. All kinds of supplies are in good demand, with prices gradually advancing.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Old Materials

Considerable buying is reported in heavy melting steel scrap, also machine and composition turnings. The market is, however, generally quiet, but prices are holding firm. Wrought iron scrap is in good demand, with light supply. Quotations on old wrought iron are stronger by 1c, pipe being quoted at 10½c and No. 1 scrap at 14¾c per pound. Scrap copper of all kinds is in good demand, and dealers report good business, with prices holding firm. The advance in the price of lead has had a proportional effect on scrap, and this week's prices show an increase of ½c per pound; heavy lead is now quoted at 7c and tea lead at 6c per pound.

Toronto, Ont, March 21.—Industrial conditions continue satisfactory and as spring approaches activity in business circles increases. Many of the principal industries in Canada are experiencing a period of unusual prosperity owing to the large volume of business coming forward. Many factories are working at capacity and are unable to handle all the business offering. A shortage of labor is beginning to be felt which will no doubt become more serious in the course of a few months particularly with regard to skilled help. This activity is due largely to war orders but the domestic demand is steadily improving as the country becomes more prosperous and the financial situation easier.

Prices generally, particularly on iron and steel products, continue in an upward direction and there is no improvement in deliveries. Congestion of freight on the railways is causing considerable delay to shipments. It is reported that more ships will be put into service later on in the Spring and so relieve the situation in regard to ocean freights, but it is difficult to see how the ships can be spared from their present work. An advance in boiler plates is announced this week and other steel products will be afforded in the near future. A sharp advance in lead is the feature of the ingot metal market.

Steel Market

The market is very strong and the upward movement in prices continues. The steel mills are working at overtaxed capacity, both domestic and export demand being exceedingly good. All indications point to the present activity lasting throughout the year as the mills are in a sold out condition. The scarcity of steel and shortage of tonnage is causing considerable anxiety to the steel companies, as there is every prospect of the scarcity of steel becoming more acute, while there is little hope of more ships being available to relieve the export situation. Prices of all steel products are very firm and some advances have been made this week. Boiler plates ¼ to ½ in., have advanced 10c and are now quoted at $3.50; heads $3.75; and tank plates 3-16 in., $3.80 per 100 pounds. The situation in plates as regard to supply is getting steadily tighter and it looks as if some consumers will come far short of getting enough to meet their needs. Quotations on cold rolled shafting are unchanged but higher prices may be expected in the near future. The new demand is heavy and some makers report being sold up for six months or longer. Wrought iron pipe has advanced in the States, makers there being sold up for four or five months with an abnormally heavy demand. Boiler tubes have advanced approximately 10 per cent. Other products which may advance shortly include wire nails, boiler and structural rivets, machine screws. Iron and steel bars are firm and un-

changed at $2.75 base, per 100 pounds.

The galvanized sheet market is strong and quotations on all brands are higher. An unusually heavy demand for black and blue annealed sheets has strengthened the market and quotations on these products are higher. The continued high price of spelter and uncertainty in the market is also affecting the galvanized sheet situation. Premier sheets No. 28 U.S. are quoted at $6.90. and 10¾ oz. at $6.95; other prices are given in the selected market quotations.

Prices of steel products in the United States continue to advance and there is no indication that the end of the upward movement is near; on the contrary higher prices are predicted. It is generally thought that prices have reached a dangerous level but the demand is as insistent as ever, being considerably more than the mills can produce. While this condition lasts there is no hope of prices being held in check. Bars, plates and shapes have advanced $5 per ton and are now quoted as follows at Pittsburgh. Bars 2.75c; plates 3c and shapes 2.50c. These figures are largely nominal as early deliveries bring premiums. The demand for billets is heavy and prices have again advanced. Bessemer and open hearth billets are now quoted at $45 and forging billets at $65 base per ton Pittsburgh. Open hearth sheet bars are higher at $45 base per ton Pittsburgh. Wire rods are unchanged at $65 per ton in Pittsburgh. The ferromanganese situation is acute and unprecedented prices are being paid for this material, ranging as high as $350 to $400 for immediate delivery. Chicago warehouse prices on bars, plates and shapes are higher and are as follows: Bars and shapes, $3.10, and plates at $3.50.

Pig Iron

The pig iron situation is unchanged and quotations are at the same level as last week. Hamilton and Victoria brands are quoted at 24 per ton with a strong market.

Old Materials

The market is firm for all kinds of old metals but quotations are practically unchanged with one or two exceptions. The domestic demand continues light, most of the business being for munitions. Lead has made a slight advance and No. 1 wrought iron is also higher. Shafting rails, and tires have advanced slightly, but malleable scrap and heavy melting steel are weaker.

Machine Tools

Increased activity in the machine tool market is looked for now that further large contracts for shells are assured for Canadian shops. A number of plants that were working on 18 pdr. high explosive shells are now being equipped for making 4.5 in. and 6 in. shells. Further contracts for still larger shells will be placed and heavy duty lathes will be required. Makers of large swing lathes and special tools for shells continue busy, while there is also a steady demand for standard equipment. Deliveries do not show much if any improvement and prices continue to advance steadily.

Supplies

Steady business is reported in machine shop supplies, the ordinary demand as well as that for shell plants showing considerable improvement. Prices on practically all lines are very firm but there are few changes to announce this week. Turpentine is higher being now quoted at 79c per gallon. Prices of white lead have been withdrawn temporarily and an advance is expected any time on account of the pig lead situation. Gasoline is unchanged but higher prices are inevitable as crude is advancing steadily; Pennsylvania crude being now quoted at $2.60 a barrel. Linseed oil is firm and unchanged. Lead sheets have advanced $2 per 100 lbs.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian.—Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

Metals

The feature of the metal markets this week is the continued upward movement of lead in New York due to the scarcity of supplies. Although the London market is quieter but firm with quotations nominal. There is no change in the copper situation and the market is dull. There is no indication of any falling off in the demand for copper and the position of this metal is a good one. Spelter has recovered and the market is strong again, heavy buying having had the effect of advancing prices in New York. Little interest has been shown in antimony lately, and the situation is unchanged. The aluminum market is easier but prices are unchanged. There has been no change in the price of solder this wek.

Copper.—The market is dull and prices unchanged. Consumers are well covered for early needs and what demand exists, is for the far off positions. Indications point to a steady market for some time to come as it seems hardly probable that quotations will go much higher or that there will be any marked decline. Quotations are nominal at 30½ cents per pound.

Tin.—The scarcity of spot tin in New York and the great difficulty to obtain licenses to ship from London have been the controlling factors in the market for several days. The supplies of tin are increasing but the consumption seems to be able to take care of all of it. Quotations are unchanged and nominal at 56c per pound.

Lead.—The situation in the lead market appears to be getting more acute. The large export demand is still the disturbing feature in New York and producers seem to be unable to figure on even a small fraction of the enquiries which are in the market. The scarcity of supplies is not temporary but extends for several months. The "Trust" have advanced their price to 7c New York but outside prices range from 7.87½c to 8.12½c, all prices being entirely nominal. Lead has advanced 1½c locally and is nominal at 10½c per pound, the highest price touched since the war began.

Spelter.—The market is strong in New York and the buying movement appears to be in progress. In London the upward movement has been well sustained on good demand. Spelter has advanced 1c locally and is quoted at 22c per pound.

Antimony.—The market is quiet and lacking in interest. The situation is unchanged and quotations are nominal at 48c per pound.

Aluminum.—The market is a shade easier and demand dull. Quotations are unchanged at 68c per pound.

Solder.—Prices are firm and unchanged. Guaranteed is now quoted at 31½c and strictly at 29¼c per pound.

Winnipeg, Man., March 18.—It is understood that most of the engineering shops in Winnipeg have received further orders for high explosive shells, which is keeping them fairly busy. There is a fairly good demand for machine tools, especially for small lathes, but these are hard to get. There is a good demand also for wood-working tools, especially from box factories, who appear to be especially busy. The reason for this is that wholesalers are doing a big trade, and are buying large

quantities of boxes. The Caledonia Box Co. and the Moncrieff Box Co., Winnipeg, both bought machinery recently. The Gregg Mfg. Co., Winnipeg, have also been in the market for some machinery for the manufacture of implements. Saw mills are fairly busy, and enquiries are coming in here and there. Transmission machinery business is particularly good, belting, although the market for the latter is in rather an uncertain state just now, and considerable cutting of prices is going on to secure business. Boilers are selling fairly well for different classes of work. Very little is doing in contractor's supplies. Small tools are selling exceedingly well. Laundries throughout the West are buying quite a lot of machinery, and on the whole, business generally is in a much more favorable condition than it has been for a long while.

Jobbers are sounding a note of warning to customers to place orders for all lines of steel goods required throughout the year, at an early date, reminding customers that manufacturers are experiencing great difficulty in securing raw material. Among the lines whose prices are up this week are wire goods, nails, and galvanized sheets. Another advance has gone into effect on brass valves. Wrought iron pipe, both black and galvanized, has again taken a jump.

METAL PRICES HIGHER

PRACTICALLY every metal for which there is a commercial use has felt the impetus of a greatly enlarged demand, due to the enormous munition orders by the belligerent nations. In some cases a positive shortage has resulted, forcing the price to levels that have never before been even approximated.

Metals for which heretofore there has been but little demand have doubled and tripled in price within a year because they were necessary in the manufacture of munitions. Others have been affected less directly, but it is safe to say that, with a few exceptions, the demand created by the war is largely responsible for the high prices now prevailing.

Nickel is the same price as a year ago, however, although the demand is much larger, and in spite of the fact that one company enjoys a virtual monopoly of the production and sale of nickel. There has been but one advance in the price of nickel since the beginning of the war, although the demand has multiplied many times. In July, 1914, ordinary nickel was quoted at 40 cents and electrolytic at 45 cents a pound.

W. H. Hairchild, of Brantford, Ont., has been appointed city engineer of Galt, Ont.

CANADIAN COMMERCIAL INTELLIGENCE SERVICE

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

Argentine Republic.
H. R. Poussette, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

Australasia.
D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

British West Indies.
E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

China.
J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

Cuba.
Acting Trade Commissioner, Lonja del Comercio, Apartado 1290, Havana. Cable address, Cantracom.

France.
Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

Japan.
G. B. Johnson, P.O. Box 109, Yokohama. Cable address, Canadian.

Holland.
Acting Trade Commissioner, Zuidbaak, 26, Rotterdam. Cable address, Watermill.

Newfoundland.
W. B. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

New Zealand.
W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

South Africa.
W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

United Kingdom.
Acting Trade Commissioner, Sun Building, Clare Street, Bristol. Cable address, Canadian.

J. E. Ray, Central House, Birmingham. Cable address, Canadian.

J. Forsythe Smith, Fruit Trade Commissioner, North British Building, East Parade, Leeds. Cable address, Canadian.

F. A. C. Bickerdike, Canada Chambers, 36 Spring Gardens, Manchester. Cable address, Cantracom.

J. T. Lithgow, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

Harrison Watson, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London.

SPECIAL TRADE COMMISSIONER—LUMBER.

H. R. McMillan, visiting Europe, Africa, Australasia and the Orient.
C. F. Just, Russia.

CANADIAN COMMERCIAL AGENTS.

British West Indies.
Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian.
R. H. Curry, Nassau, Bahamas.

Norway and Denmark.
C. E. Sontum, Grubbeged No. 4, Christiana, Norway. Cable address, Sontums.

South Africa.
D. M. McKibbin, Room 34, Permanent Buildings, Harrison Street, Johannesburg.

E. J. Wilkinson, Durban, P.O. Box 673, Durban, Natal.

CANADIAN HIGH COMMISSIONER'S OFFICE.

United Kingdom.
W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England.
Cable address, Dominion, London.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Stratford, Ont.—Fire on March 16 did about $5,000 damage to the MacDonald Thresher Co.'s plant.

Ottawa, Ont.—The Ottawa Steel & Iron Co. will rebuild their plant, which was recently damaged by fire.

Cobourg, Ont.—The Cobourg Felt Co. is in the market for a 16-in. engine lathe, 4 to 6 ft. between centres.

Fort Erie, Ont.—The directors of the International Safe Co. have decided to build an addition to their plant.

Vancouver, B.C.—The Canadian Consolidated Mining and Smelting Co. have started work on the construction of a large copper refinery at Trail.

Montreal, Que.—The plant of the Canadian Metal Manufacturing Co. was recently damaged by fire to the extent of $15,000.

Yamachiche, Que.—The Brunelle Furnace & Boiler Co. propose to instal electric motors and equip their machinery for electrical operation. Manager, A. Heroux.

Renfrew, Ont.—The Renfrew Machinery Co. plant was completely destroyed by fire on March 14. The loss is estimated at approximately $100,000, which is covered by insurance.

Port Arthur, Ont.—Work has been started on the erection of an addition to an elevator for The Davidson & Smith Elevator Co. Barnett & McQueen, are the contractors, Fort William. Estimated cost, $250,000.

Walkerville, Ont. — The Canadian Brush Machinery Co. will establish a plant here for making the Liebig solid back brush machines, now being manufactured at Detroit, Mich. The company has recently been granted a Dominion charter, with the following officers: W. G. Liebig, president; W. M. Swan, vice-president; W. Elsey, managing director and secretary-treasurer.

Electrical

Bedford Mills, Ont.—The Bedford Mills Electric Co., Newboro, Ont., contemplate the installation of a 60-k.w. dynamo, water wheel, transformers, etc. Estimated cost, $6,000. Manager, R. P. Tett.

Russell, Man.—It is proposed to raise $5,000 to extend and complete the electric lighting system.

Kintore, Ont.—An effort is being made to have hydro power installed in East Nissouri Township.

Municipal

Lindsay, Ont.—The Town Council will purchase a truck for the fire hall.

Galt, Ont.—The City Council are considering the purchase of a motor fire engine.

Kingston, Ont.—The City Council has decided to purchase road-making machinery.

Burlington, Ont.—The Town Council contemplate purchasing a motor fire truck. A by-law will be submitted to the ratepayers to authorize the purchase.

Saskatoon, Sask.—An extension will be made to the city power house to make room for a new rotary converter and switchboard, which are being supplied by the Ferranti Co.

Elmira, Ont.—The Town Council have let the contract for extensions to the waterworks system to A. M. Bauman. Contractor is now receiving prices on iron and lead piping, brass fittings and pig lead.

General Industrial

Lindsay, Ont.—F. R. Wilford & Co., have prepared plans for an addition to their factory on Kent Street.

Lethbridge, Alta.—The City Council proposes to purchase a motor-driven booster pump. Estimated cost, $4,000.

Orillia, Ont.—The Canada Builders Ltd., of Toronto, propose building a planing mill here.

Listowel, Ont.—Nathan Calder proposes to instal equipment at his planing mill, to be operated by hydro power.

Peterborough, Ont.—The Bonner-Worth Co., will build an addition to their factory here. Estimated cost $8000.

Montreal, Que.—Fire at the Canadian Rubber Co.'s factory on Notre Dame Street East, on March 19, did about $50,000 damage.

Orillia, Ont.—The Town Council are considering the installation of new machinery at the sewage pumping station. Engineer, W. K. Greenwood.

Aylmer, Que.—The Town Council have been ordered by the Provincial Board of Health to construct a filtration plant. Estimated cost, $20,000.

Saskatoon, Sask.—The Alaska Bedding Co., of Winnipeg, have purchased a site here and will build a factory. F. S. Baker, the manager of the Winnipeg factory, has charge of the work.

Owen Sound, Ont.—The Galbraith Woodenware Co. are making arrangements to develop their lines of wood specialties. New machinery will be installed. Edward Galbraith is manager.

Contracts Awarded

Stratford, Ont.—The Stratford Bridge Iron Works have been awarded a contract for iron castings by the City Council.

Ottawa, Ont.—Doran & Devlin, of Ottawa, have been awarded a contract by the City Council for the construction of the pumping station on Lemieux Island at $54,000.

Ottawa, Ont.—The City Council have let contracts to the Victoria Foundry Co. for cast iron pipe and specials at $9,233, and for valves to the General Supply Co., Ottawa, at $7,666.

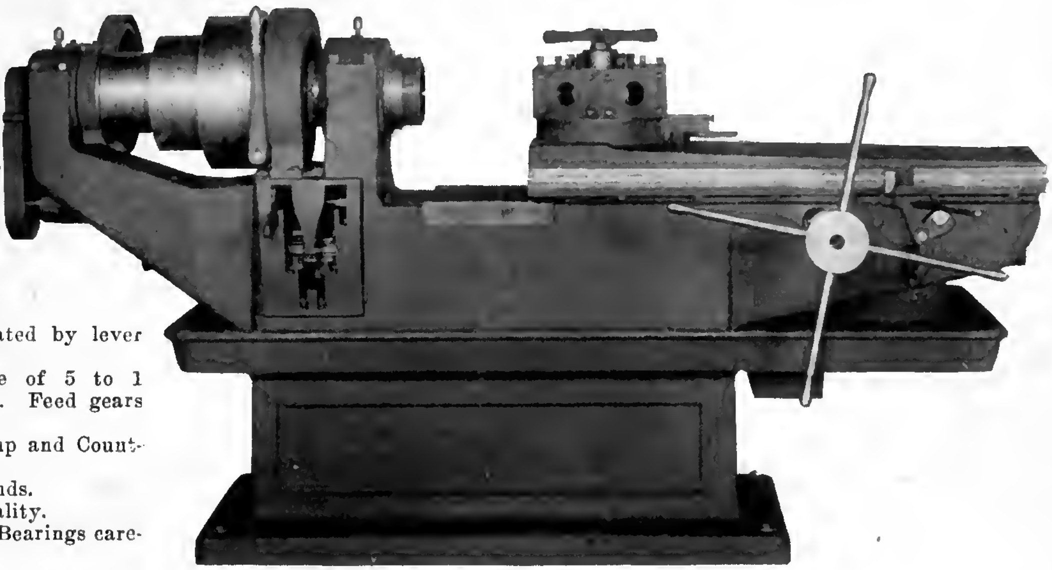
Hamilton, Ont.—The Board of Education has awarded the following contracts for the Robert Land School: Electrical work, the Electric Supply Co., $4,766; hand rails, Canada Wire Goods Co., $149.

Winnipeg, Man.—The Dominion Bridge Co. has been awarded the contract for the steel work for the T. Eaton Co. new building. The cost of the steel alone is estimated at $200,000. The building will be 200 ft. long by 123 deep and eight storeys high. The Cater-Halls-Aldinger Co. are the general contractors for the first unit.

GREENSBORO TURRET LATHE

For Boring and Recessing Base of 4.5 and 6" Shells

Spindle is made of Carbon Steel, 8" diam. in front bearing and bored 6¼" diam. 8" deep, so part of shell is held within bearing to prevent overhang.
Spindle runs in heavy bronze bearings.
Head has friction back gear, 5½" belt.
Turret is bored for 3" Bars, has power feed with automatic stop.
Quick-change feeds operated by lever under head.
Turnstile has a leverage of 5 to 1 though gearing into rack. Feed gears made of steel.
Equipment: Oil Pan, Pump and Countershaft.
Weight: About 6,000 pounds.
Workmanship of Best Quality.
All Spindles ground. All Bearings carefully scraped.



THE A. R. WILLIAMS MACHINERY CO., LIMITED
TORONTO CANADA

O. K.

"Wish to say that in my estimation Geometric Tools are O.K."--J. W. D., Shop Foreman.

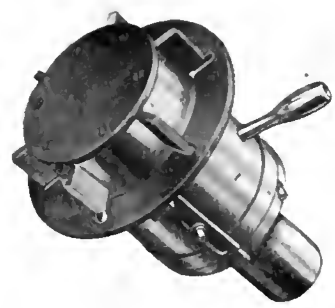
The opinion of this Shop Foreman is the opinion of all users of Geometric Screw-cutting Tools.

Every Die Head and Collapsing Tap bearing the stamp of distinction—"**Geometric**"—has been tested by experts.

Can be arranged with shank to fit any make of Screw Machine.

Geometric Threading Tools will produce for you either external or internal screw threads of any diameter, length, pitch and form.

Make our acquaintance now, through our literature, and when you are ready to order, you will know just the tool needed. Tell us the class of thread-cutting that interests you, and we will send booklet describing tools to suit.



The Geometric Tool Company

NEW HAVEN, CONN.

Canadian Agents: Williams & Wilson, Ltd., Montreal. The A. R. Williams Mchy. Co., Ltd., Toronto, Winnipeg, St. John, N. B.

Tenders

St. Marys, Ont.—Bids will be received until March 31 by the superintendent of the waterworks department for a 2,000,000-gallon centrifugal pump.

Barrie, Ont.—Tenders, will be received until Thursday, March 30, for the supply of road oil for the year 1916. J. S. Laing, Town Engineer .

Ottawa, Ont.—Tenders will be received by the Board of Control, up to Tuesday, March 28, for two motor driven street flushers. Specifications may be obtained on application to the city engineer's office, City Hall, F. C. Askwith, acting city engineer.

Toronto, Ont.—Tenders for watt hour meters, addressed to the chairman Toronto Electric Commissioners, will be received until Tuesday, March 28th. Specifications and forms of tender may be obtained at the office of the purchasing agent, 15 Wilton Avenue.

Port Hope, Ont.—Tenders will be received up to Saturday, March 25, for the construction of 71 ft. concrete arch truss superstructure on Peter Street. Plans with J. W. Sanders, Town Clerk, Port Hope, Ont., and Bowman & Connor, 31 Queen Street West, Toronto.

Quebec, Que.—Tenders for freight shed and grain galleries, will be received at the Quebec Harbour Commissioners' Office, Pointe-a Carey Wharf, Quebec, up to April 15 next. Plans and specifications of the contemplated work may be seen at the Harbour Engineer's Office, Pointe-a-Carey Wharf. St. George Boswell, Chief Engineer

Toronto, Ont.—Tenders for underground work, addressed to the chairman Toronto Electric Commissioners, will be received until Tuesday, April 4th. Details of work to be performed, consisting of laying of cable ducts, building man-holes and transformer vaults. Specifications and form of tender may be obtained at the Engineering and Purchasing Department, 15 Wilton Avenue.

Building Notes

Vancouver, B.C.—The Ford Motor Co. propose building a service and assembling plant here. The building will be 110 by 115 feet.

Toronto, Ont.—Robertson Brothers have been granted a permit to erect a five-storey brick addition to the factory at 103 Queen East, at a cost of $25,000.

Toronto, Ont.—The Gutta Percha Rubber Co. have been granted a permit to erect a two-storey brick machine shop and garage on the east side of West Lodge Avenue, at a cost of $18,000.

Fergus, Ont.—It is proposed to raise $10,000 by way of a loan to the Superior Barn Equipment Co. A by-law will be submitted to the ratepayers.

Windsor, Ont.—The Board of Education have decided to appropriate a further sum of $90,000 for the new Collegiate Institute. A by-law will be submitted to the ratepayers to authorize the additional outlay.

New Incorporations

The Zenith Coal & Steel Products, Ltd., has been incorporated at Ottawa with a capital of $35,000 to carry on the business of steel, metals, chemicals, and machinery merchants and manufacturers. Head office to be situated at Montreal, Que. Incorporators, J. W. Blair, F. J Laverty and C. A. Hale, all of Montreal

The Foundry and Machine Co., has been incorporated at Ottawa, Ont., with a capital of $200,000 to operate brass, iron or other metal foundries, with head office at Montreal. Incorporators: John James Tolland, Joseph Ulric Emard and Charles Emard all of Montreal.

The Jewel Mfg. Co., Hamilton, Ont., has been incorporated with a capital stock of $10,000 by Harry H. Hannon and Albert M. Boyington of Hamilton, John S. McConkey and others of London, Ont., to manufacture paper presses, etc.

The Gill Motor Co., of Montreal, Que., has ben incorporated to manufacture machinery, mechanical specialties, motors, engines, etc. $99,000 capital stock; by Thomas M. Gill of Lewiston, Me., George M. Smyth, Walter Gill and others of Montreal.

Canadian Hardwoods Ltd., have been incorporated at Toronto with a capital of $150,000 to carry on a lumbering and saw mill business with head office at Ottawa. The provinsional directors are Charles Magee, John T. MacCraken and Edward McMahon all of Ottwa.

The Acme Tire & Rubber Co. has been incorporated at To,ronto with a capital of $400,000 to manufacture tires and rubber goods with head office at Toronto. The provisional directors are J. Max Bullen, Harold L. Steele and Francis H. Hurley all of Toronto.

The Bay of Fundy Tide-power, Ltd., has been incorporated at Ottawa with a capital of $50,000 to carry on the business of an electric light, heat and power company. Head office to be situated at Wolfville, N. S. Incorporators, G. B. Cutton, R. P Clarkson and W. L. Archibald all of Wolfville, N.S.

The Salt & Potash Co. of Canada, Ltd., has been incorporated at Ottawa, with a capital of $500,000 to manufacture, methylate, chemicals, spirits, explosives and other products. Head office to be situated at Toronto, Ont. Incorporators, T. A. Burgess, J. O. Carss and C O. Wood all of Ottawa, Ont.

The Utility Electric Manufacturing Co., has been incorporated at Toronto with a capital of $40,000 to manufacture electric ranges, stoves, heaters, and any or all kinds of electrical goods or appliances. Head office to be situated at London, Ont. Incorporators, R. J. Gracey and J. Sussex of London, Ont.

The Canadian Brush Machinery Co., has been incorporated at Ottawa, with a capital of $50,000 to carry on business as mechanical engineers, machinists and manufacturers of machinery and tools, at Walkerville, Ont. Incorporators, W. G. Liebug and W. M. Swan of Detroit, Mich., and William Elsey of Windsor, Ont.

The Acme Steel Goods Co., of Canada, Ltd., has been incorporated at Ottawa, Ont., with a capital of $3,000 to manufacture all kinds of steel goods at Montreal, Que. The incorporators are James Edwin MacMurray and George Claude Longman of Chicago, Ill., and Poseph E. Beauchamp, of Montreal, Que.

The Kingdom Mining, Smelting & Mfg. Co., has been incorporated at Ottawa, Ont., with a capital of $750,000 to prospect for, and develop mineral deposits and to smelt ores, metals, etc., Head office Montreal, Que. and the incorporators are Louis Anathase David, Adhemar Gaston Munich, and S. Hinson Read all of Montreal.

The Doty Engine Co., has been incorporated at Ottawa with a capital of $100,000 to carry on the business of iron founders, mechanical engineers and manufacturers of machinery, tool makers, brass and other metal products. Head Office to be situated at Toronto. Incorporators, J. S. Lovell, W. Bain, and J. J. Dashwood all of Toronto.

The Consumers Metal Co., has been incorporated at Ottawa, Ont., with a capital of $40,000 to manufacture all classes of base and combined metals and metal powders, liquids, etc., with head office at Montreal, Que. The incorporators are Henry Mulvena, Thomas Barnard Gould, and Duncan MacDonald all of Montreal, Que.

The Canadian Calumet & Montana Mining Co. has been incorporated at Ottawa, with a capital of $40,000, to de-

velop mineral and other deposits, and to smelt, roast and otherwise treat ores, metals and mineral substances of all kinds. Head office to be situated at Toronto. Incorporators: T. A. Burgess, J. O. Carss and C. O. Wood, all of Ottawa.

Refrigeration

Sarnia, Ont.—The Sarnia Creamery Co., it is reported, has decided to enlarge its creamery and install a refrigerating and ice making plant.

Red Deer, Alta.—It is announced that a large pork packing establishment may be located here during the coming season. Finances to the extent of a million dollars are assured.

Cranbrook, B. C.—Walkley & Johnson, are having their meat market equipped with a 3-ton refrigerating plant supplied by the Armstrong Machinery Co., Spokane, Wash.

Railways--Bridges

Ottawa, Ont.—A new bridge over the Niagara River is projected in the bill incorporating the Ontario-Niagara Connecting Bridge Co., which is in process of going through Parliament. E. R. Wood, of Toronto, heads the list of incorporators.

Marine

Collingwood, Ont. — The Northern Navigation Co. steamer "City of Midland" was destroyed by fire here on March 17. The loss is estimated at $40,000.

Sarnia, Ont.—The Northern Navigation Co. has started a $25,000 repair job on the forward cabins of the steamer Saronic, which were badly burned last Fall, at the time the steamer Majestic was destroyed.

Kingston, Ont. — The Department of Public Works is now taking definite action to secure data about Kingston harbor, so that extensive improvements that will make it ready for the deepening of the Welland Canal may be made.

Sarnia, Ont.—Activity on the local water front is gradually increasing. The owners of the many freighters and lake boats tied up here have started fitting out, to be ready for the opening of navigation, which is now only about six or seven weeks away.

Sarnia, Ont.—The underwriters are asking bids for raising the sunken steamer Charles S. Price, which lies upside down on the bottom of Lake Huron, thirteen miles from Sarnia, where she turned turtle on Sunday, November 9, 1913, during the big storm. The ship lies in 70 feet of water.

Port Arthur, Ont. — Ice conditions seem favorable to an early opening of navigation. The ice breaking tugs will be ready to cut a channel any time after March 15, and the first of April may see the boats moving. Grain in the elevators at the head of the lakes totals approximately 35,000,000 bushels.

Vancouver, B.C.—Plans and specifications for the car ferry slips at Patricia Bay and the temporary transfer facilities at New Westminster for the Canadian Northern Railway's barge service between the Mainland and Vancouver Island, are expected to arrive from Toronto shortly, according to Mr. McLeod, general manager of the C. N. R.. The contract for the slips and for the barges and tugs will be let before Mr. McLeod leaves for the East. A contract for a $20,000 trestle has already been let.

Halifax, N.S.—The Halifax Graving Dock Co. is making another addition to its plant by building and equipping a floating electric welding plant. The outfit will be a complete one on a barge, and will generate its own electricity. It will be able to go alongside of a ship anywhere on the waters of the harbor. The equipment is also designed for building up weak plates in a ship's hull.

New Freighter Launched.—A steel bulk freighter constructed for the Geo. Hall Coal Co. of Ogdensburg, N.Y., was successfully launched from the Wyandotte yards of the Detroit Shipbuilding Co. on March 11. The new steamer will be known as the George L. Eaton, and is to be used in the coal trade on the lower lakes and St. Lawrence River. She is of full Welland Canal size, 244 feet long, 43 feet beam, and 20.5 feet deep. Her carrying capacity is about 3,000 tons.

Personal

F. Orr Lewis, president of Canadian Vickers Ltd., has returned to Montreal after an extended visit to England.

Lorne Thompson, head of the Stores Department of the C. N. R., has joined the staff of the Munitions Board to look after the transport end of the board's business.

J. B. Walker, formerly machine tool salesman with H. W. Petrie, Ltd., has accepted a similar position with the Garlock Machinery Co., 197 Wellesley Street, Toronto.

John Keillor, gas engineer, Hamilton, has received the appointment of superintendent to the Vancouver Gaslight Co., Vancouver, B.C. Mr. Keillor was previously manager of the Hamilton Gaslight Co.

Trade Gossip

The Canadian Cartridge Co., have surrendered their charter and the company has been dissolved.

The Dickson Bridge Works Co., Cambellford, Ont., have increased their capital stock to $100,000.

The Riordan Paper & Pulp Co., Merritton, Ont., will spend $200,000 on a plant for making bleached pulp.

The Lincoln Paper Mills, of Merritton, Ont., are going into the manufacture of gasine and grease proof paper.

The Interlaken Tissue Paper Mills, of Merritton, Ont., who make all kinds of tissue paper will make an extension to their plant, estimated to cost $50,000.

The Mainland Engineering Co., Victoria, B.C., has been incorporated, and will take over the old Mainland Iron Works plant for the manufacture of machinery, tools, etc.

The Toronto Transmission Co., have equipped a plant at 840 Dundas St., Toronto, for making general transmission machinery, such as hangers, clutches, pulleys, etc. Fred K. Robinson, formerly sales manager with the Dodge Co., Toronto, is manager of the new concern.

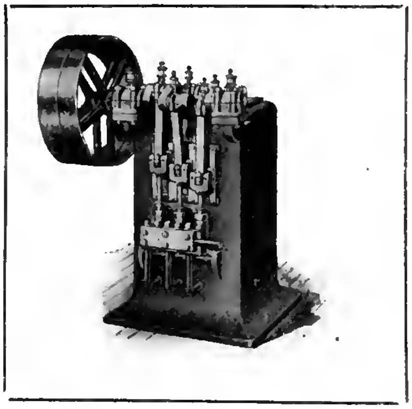
Fraser & Chalmers of Canada, Ltd., of Montreal, have recently been awarded the contract by the City of Regina, covering the delivery and erection of a 300 h.p. steam turbine, direct connected to two centrifugal pumps, having a total capacity of seven million Imperial gallons per twenty-four hours.

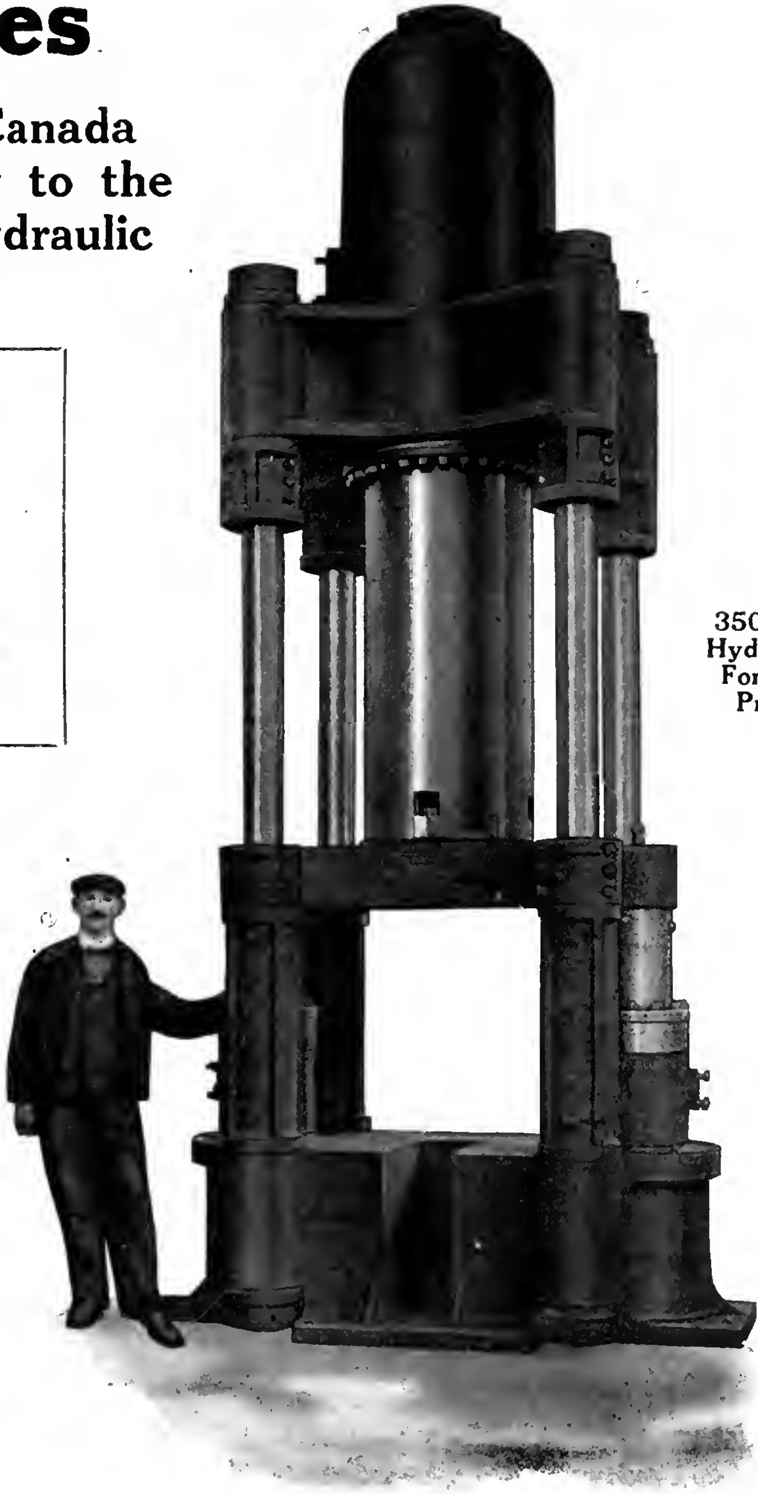
The Turbine Equipment Co., Engineers, Toronto, Ont., have recently secured an order from the Imperial Oil Co., for ten De Laval steam turbine-driven centrifugal pumps to be installed at their new refinery, Montreal; also a contract from the Standard Chemical, Iron & Lumber Co., for a one and a-half million gallon De Laval motor-driven centrifugal pump.

Vancouver, B.C.—The British Columbian Fisheries, Ltd., will sell their entire plant and equipment, including buildings, machinery, tools, refrigerating plant, sawmill and machinery, fertilizer plant and equipment, power plant equipment, steam trawlers and scows, etc. Tenders will be received up to April 15, 1916, and full particulars may be obtained from James Keppel Ball, Yorkshire Building, Vancouver, B.C.

Presses for All Purposes

The only shop in Canada devoted exclusively to the manufacture of Hydraulic Equipment





350-Ton Hydraulic Forging Press

Forging Presses
Veneer Presses
Vulcanizing Presses
Packing House Presses
Baling Presses
Pulp Presses
Tannery Presses
Belting Presses

Hydraulic Pumps and Accumulators

for use with all the Presses we make

CANADIAN BOOMER & BOSCHERT PRESS COMPANY, LIMITED

18 TANSLEY STREET, MONTREAL. **Cable Address: "PRESSCO"**

Charles Sellers, president of the Peerless Furnace Co., Toronto, which he founded over twenty-five years ago, died on March 20, aged 82. Mr. Sellers was a native of Glasgow, Scotland, but had resided in Toronto for over 60 years. He was superintendent of the Gurney Foundry Co. for more than 20 years.

Britain Restricts Exports.—The Daily Gazette, London, says that among the additional articles whose exportation to all destinations is prohibited are, cinematograph films, gramophone and other sound instruments, records, sensitive films and plates, both exposed and unexposed, tungsten, clinical thermometers and surgical instruments.

Toronto Harbor Commission. — A $700,000 programme has been outlined by the Harbor Commission in connection with next summer's work. The work in Ashbridge's Bay and at the Humber will be continued, and, in addition, the work of transforming the old old harbor will be commenced. It is announced from Ottawa that a permanent head line has been established in the harbor, from Bathurst to Yonge Street. The plans provide for the establishing of a 17-acre industrial area at the foot of Bathurst Street, which will be served by 800 feet of dock and 20 feet of water. There will also be modern freight sheds and a factory building. In connection with the new windmill line, the railways have waived their riparian rights between Bathurst and York Streets and the companies will join the commission in an application to the Government for approval of the new pierhead and bulkhead lines, and the Harbor Commissioners will receive the patents to the new lots lying between pierhead and bulkhead lines, Hon. Mr. Rogers and Hon. Mr. Hazen both having signed them.

Catalogues

Air Hoists.—Catalogue No. 119, issued by the Whiting Foundry Equipment Co., Harvey, Ill., illustrates and describes an interesting and varied line of air hoists for different classes of work. The special features of the various types are dealt with in detail, and a table is included giving capacities and other data covering the standard sizes of hoists. A copy of this catalogue will be sent free on request.

The Monometer Mfg. Co., Birmingham, England, have sent us a series of bulletins dealing with a metal melting furnace, automatic heat control and an aluminum melting furnace. The metal melting furnace is designed for handling ingot metals and metal alloys. The automatic heat control is done by means of a self-acting heat regulator used in conjunction with the furnaces. The third bulletin describes a specially designed furnace for melting aluminum without oxidation. The bulletins are fully illustrated and printed in two colors.

Grinding and Polishing Machinery.—The Builders' Iron Foundry, Providence, R.I., has published a new 104-page catalogue describing its complete line of "Builders'" grinding and polishing machinery and patented "Pull" countershafts, which are well known as a safety device. The catalogue is 6 in. x 9 in., and bound in myrtle green antiquarian stock, and contains altogether 48 different half-tone illustrations. Both halftones and printed matter are set off by a green tinted background. The catalogue is conspicuous because of its careful arrangement and the high grade of printing and engraving which it represents. Copies will be forwarded upon request.

Vacuum Traps.—The W. E. Clark Co., Toronto, Ont., have issued bulletin "B" dealing with the "Clark" vacuum trap for heating systems. Considerable space is devoted to steam heating systems and troubles often met with, followed by a description of the "Clark" vacuum system and diagram showing a typical installation. The "Clark" trap is described and its action fully explained while the construction is clearly shown by means of a cross sectional drawing. Other lines dealt with include the "Clark" air line valve and a temperature booster for hot water systems. Copies of this bulletin may be had gratis on application.

Book Review

Forest Protection in Canada, 1913-1914, is the title of a report just issued by the Commission of Conservation, Ottawa. The report was compiled by Clyde Leavitt, Chief Forester of the Commission, and is of particular interest in view of the statement that Sweden proposes to cut off the export of chemical pulp to Great Britain. It contains much information respecting the work of the provincial forest services and of Federal departments entrusted with the care of our forests. The report treats exhaustively with the question of fire protection of forest lands along railway rights-of-way. Through co-operative action, great headway has been made in securing the reduction of forest losses through fires traceable to railway causes. The forests of British Columbia and on Dominion lands in the West have been dealt with in reports containing the results of special studies conducted by Dr. C. D. Howe and J. H. White. The Trent watershed in Ontario has also received

especial attention in a report of an investigation by Dr. C. D. Howe, in the Townships of Burleigh and Methuen. This district is important in that, while of very little value as an agricultural area, it is being repeatedly overrun by forest fires and the little remaining merchantable timber destroyed. It is suggested that the area be placed under the control of the Dominion Forestry Branch for protection from fires and for reforestation.

CREDIT ESTABLISHED FOR MUNITION ORDERS

THE Canadian chartered banks, through the Canadian Bankers' Association, have agreed to establish in Canada a credit of $75,000,000 for the Imperial Treasury, to be drawn upon by the Munitions Board as required from time to time in payment of munitions orders to be placed in Canada during the next two months. This arrangement is the result of the negotiations which have been proceeding during the past two months or so between the bankers, the Finance Minister, and J. W. Flavelle, chairman of the Imperial Munitions Board.

The credit thus established, in addition to the fifty millions placed by the Government to the credit of the Imperial Board out of the domestic loan of last year, gives a total amount of $125,000,000 raised in Canada towards financing the British war orders in the Dominion. The total amount of these orders is now upwards of $300,000,000, so that Canadians' share of the financing has been about one-third.

New Orders Now Ready

New orders are now ready to be placed by the Munitions Board, and during the next three months it is expected the total of these orders from Britain will run up to over one hundred millions. In anticipation of the financial arrangements just completed with the bankers, the Imperial Ministry of Munitions has already authorized during the past two weeks further orders in Canada aggregating twenty millions.

If continued satisfactory arrangements for financing war orders in Canada can be arranged during the coming summer, there is no doubt but that there will be a steadily increasing flow of orders from Britain for munitions of all kinds so long as the war lasts.

Further Arrangements Later

Before the present additional credit of $75,000,000 is exhausted it is probable that further arrangements will be made for new credits to finance the orders of following months.

A second domestic loan, and another large advance from Canadian banks, may be expected later on.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

FOR SALE—NO. 2 UNIVERSAL MILLING machine. J. A. Harvey, 16 Pearl St., Toronto.

FOR SALE—FIFTEEN HUNDRED GALLON Duplex Steam Pump, used sixty days. Size twenty x twelve x sixteen stroke. Apply Fraser & Chalmers of Canada, Limited, Montreal. (12)

FOR SALE—GARAGE IN GOOD WHEAT district. Snap for a good, practical man. About forty cars in vicinity. Will sell cheap if taken at once. Address Box 74, Hanley, Sask. (13)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London, Ont.

FOR SALE OR TO EXCHANGE FOR A smaller tool—Bertram gap lathe, 16-ft. bed, swing 40 inches in gap, two face plates, one 4-jaw chuck, one steady rest, one turret head, and countershaft. All in first-class condition. Offered at a big reduction. Shipment could be made in ten days. Box 182, Canadian Machinery.

FOR SALE—THE FOLLOWING CANADIAN General Electric motors: 1 KT 8-5-900 C, 550 V., less base with pulley; 2 MTC 5200, 5 H.P., 900-500 V., 60 cyc., A.C., 3-phase, with solenoid brakes mounted, with controller and rheostat; 1 MTC 5200, 5 H.P., 900-500 V., 60 cyc., A.C., with controller and rheostat; 1 MTC 5200, 5 H.P., 900-550 V., 60 cyc., A.C., with controller and rheostat. Whiting Foundry Equipment Co., Harvey, Ill., U.S.A.

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double bandsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

FOR SALE—1 CLEVELAND ACME MAchine Co.'s 6" Cap. Single Head, Tapping Machine—back-geared, automatic feed, cone step pulleys and countershaft with two extra chucks. Particulars from Taylor-Forbes Company, Limited, Guelph, Ont. (13)

FOR SALE, AT A SACRIFICE—SAW MILL outfit, A1 condition; 50 H.P. stationary boiler, 45 H.P. "Leonard" engine, "Green" carriage, Simonds saw, edger, planer, lathmill, etc. Easy terms. Write quick. R. Parker & Sons, Uno Park, Ont. (12)

FOR SALE—2-PHASE INDUCTION MOTORS, 1 only WESTINGHOUSE, Type C, 50 H.P.; 1 only WESTINGHOUSE, Type CCL, 50 H.P.; 1 only CANADIAN GENERAL, type 10, 20 H.P. In excellent condition. Prices attractive. Full particulars on application. Cummer-Dowswell, Limited, Hamilton, Ont.

FOR SALE—PLANING MILL AND FACTory, doing good business. Terms $2,000.00 cash. Balance to suit buyer. Address O. Ribble, Bronte, Ont. (13)

AUTOMOBILE BUSINESS AND NEW Garage for sale. Overland agency; lots of repairing; also Overland roadster, new tires, $300.00; 10 light D.C. generator, $25.00; K.W. magneto (new), $15.00. W. E. Hawes, Otterville, Ont. (13)

SITUATIONS VACANT

JUNIOR DRAFTSMAN, EXPERIENCE ON structural work an advantage; permanent position to right man; give fullest possible particulars. Box 174, Canadian Machinery. (7)

WANTED — MACHINISTS AND FLOOR hands on heavy and miscellaneous medium work; steady employment, modern shop, good wages. Apply, stating age and experience, P.O. Box 6, Walkerville, Ontario. (6)

SITUATIONS WANTED

MECHANICAL SUPERINTENDENT, EFFICIency engineer and master mechanic having twenty years' experience in all lines of general machine, blacksmith, carpenter and pattern shop practice, foundry work, power plant, refrigerating and electrical engineering, is open for engagement. Box 177, Canadian Machinery. (11)

CHIEF ENGINEER — 26 YEARS' EXPERIence. Factory and Central Station, Alternating and Direct Current, Gas or Steam Engines, efficiency guaranteed, own instruments, best of references. Box 181, Canadian Machinery. (12)

AS MAINTENANCE ENGINEER OF FACTory, power or lighting plant, where economy is a factor, wide experience, best of references. Box 180, Canadian Machinery. (12)

WANTED

WANTED TO RENT — SMALL MACHINE shop, two or three small lathes, miller, drill, motor, furnace, usual small tools. Full particulars and terms. Box 179, Canadian Machinery. (13)

AGENTS WANTED

BRITISH HOUSE MAKING SYRINGES AND spraying machines for every possible use, need Canadian agents. The line is the most complete in the world and includes knapsack and ordinary spraying machines for fruit growers, limewashing machines for farms, factories, etc. Disinfecting machines for all purposes. Anything in the way of spraying and washing machines made to suit the market. Agents must be aggressive and ready to work the line thoroughly. Write: Spraying Machines, c/o Canadian Machinery, 143 University Avenue, Toronto.

FOR SALE

Two 96-horse-power Gas Engines.

Complete with producers.

Made by the largest English manufacturers.

WILL SELL CHEAP

Empire Mfg. Co., Ltd.
London, Ontario.

WANTED

Second-Hand MACHINERY

If you want second-hand equipment of any sort, advertise for it in our Classified Section — you'll get results.

CANADIAN MACHINERY
Classified Ads. Department
143-153 University Avenue
TORONTO - ONTARIO

AGENCY WANTED

A firm in England is desirous of securing the sole agency for Great Britain for twist drills, taps, stocks, dies, reamers, milling cutters, etc. Please communicate full particulars to

Box 175
Canadian Machinery

Do precede pp 275

101

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, MARCH 30, 1916 No. 13

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

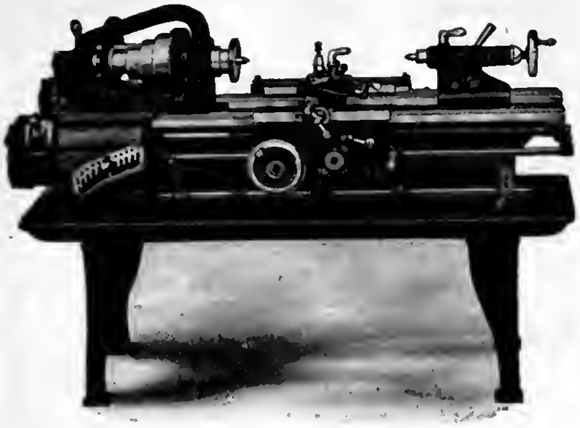
CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.



The "HENDEY" Lathe

INDEX TO ADVERTISERS

The Manufacture of Mark II Gaines for 18 Pdr H.E. Shells

Staff Article

To a greater extent than any other part of a shell, the gaine offers full scope for the application of automatic machinery. Simplicity of operations and the use of easily worked material aid largely in the rapid production of pieces with continued high degree of accuracy.

NOT the least important of the component parts of the high explosive shell fuse is the gaine, which, since it contains the detonating charges may be correctly known as the "exploder." This part is secured to the fuse by means of the adapter, from which it extends downwards into the body of the shell.

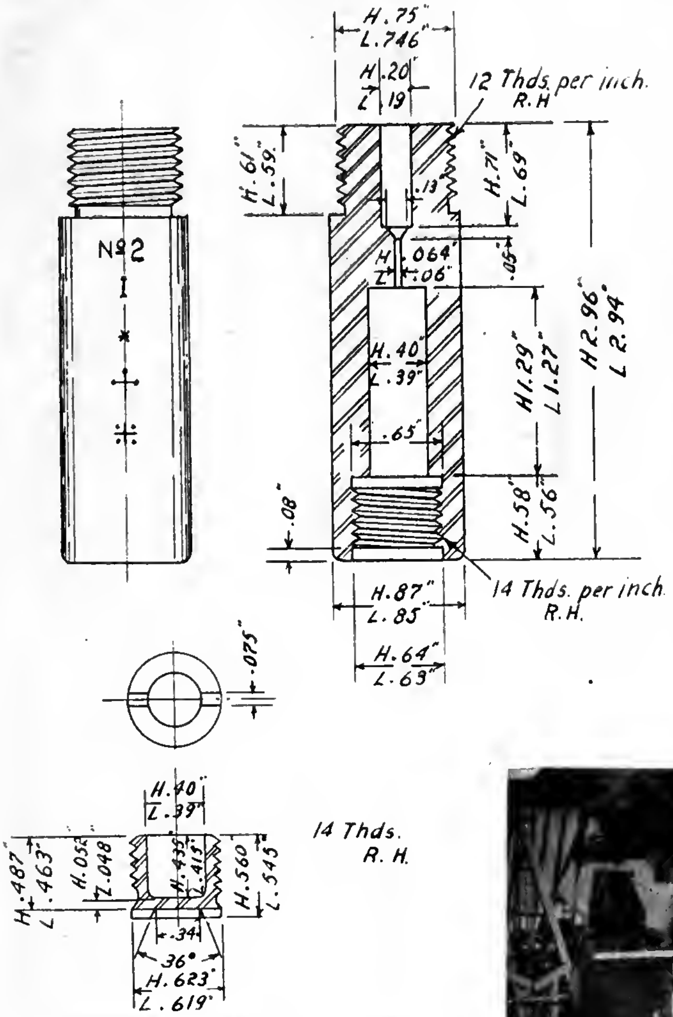


FIG. 1. SKETCH OF GAINE AND PLUG.

The mark II. gaine here referred to, is used in connection with that type of shell commonly known as the 18-pounder, and its constructional features and the manner in which it is exploded may be briefly described as follows: Referring to Fig. 1 it will be seen that the gaine, which is made of a good quality cold rolled steel is composed of two parts, the body and the bottom plug. The body is provided with two chambers, which are connected by means of the small flash hole shown. Both chambers are loaded with the necessary explosive. The plug which is screwed into the bottom recess of the gaine, is also made of cold rolled steel, and its purpose is merely to hold the explosive in place.

Function of the Gaine

The gaine is exploded upon impact of the fuse only. When the shell is fired, the force or impact of the explosive charge in the cartridge case causes a small pin in the fuse to drop back and compress a detent spring. Being thus forced back, the action of gravity permits the pin to fall to one side, where it is caught by the edge of a recess and prevented from assuming its original position.

The pin referred to holds the centrifugal bolt in position, but the centrifugal action of the shell now causes this to drop back, clear of the graze pellet. All that prevents detonation now is a hair spring which is of sufficient tension to hold the graze pellet back thus preventing the primer which is held in the counter-bored end of the pellet, from coming in contact with the needle. An explosion is now free to take place upon the slightest impact of the shell. When this occurs the graze pellet jumps forward, compressing the spring, until the primer comes in contact with the needle and is exploded. The flame now extends downwards and explodes the material in each respective chamber of the gaine, the explosion in the bottom chamber being of such intensity that the gaine is shattered, and the charge of lyddite contained in the shell is exploded.

Type of Machine Used

The machining operations on the gaines with the exception of the tapping are done exclusively on Brown & Sharpe automatics; the general arrangement of these machines being shown in Fig. 2. By this method of laying out the plant, the floor space is used to the best advantage.

For the first operation, a number of B. & S. automatics No. 2, similar in design to that shown by Fig. 3, are used.

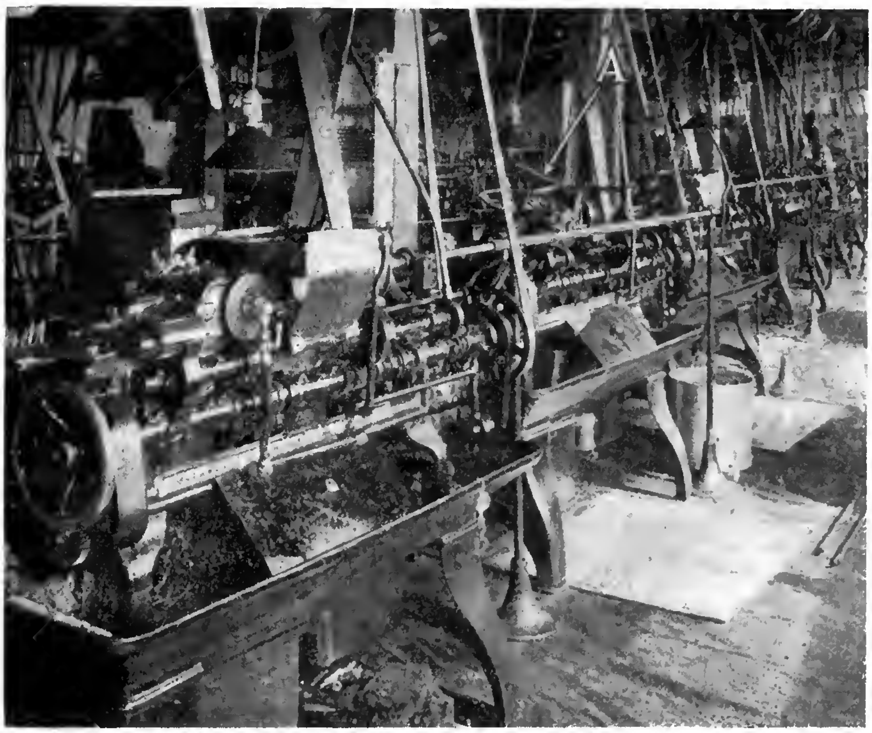


FIG. 2. ARRANGEMENT OF AUTOMATIC MACHINES.

A sketch showing the arrangement of the tools on both the turret and cross-slide shown respectively at A and B, Fig. 4, and the sequence of each respective operation is shown in Fig. 5. The stock is first rough drilled to form the diameter of the internal threaded portion, which is next reamed to the correct size and the bottom shoulder squared. The third turret face has a special attachment as shown for recessing the back and front ends of this diameter, while the tools 4 and 5 rough drill, and ream and square face respectively, the main or bottom chamber. While the turret is completing this cycle of operations the two cross-slide tools A and B are also being fed into the work. The forming tool B, the design of which is shown at A, Fig. 6, is placed in the rear cross-slide and forms the threaded diameter at the same time recessing the end of this diameter as shown. In the meantime the front cross slide holding the cutting off tool A feeds into the stock, cutting it off to the necessary length.

Recessing Tool

An interesting feature used in connection with the first operation is the recessing tool, and holder, a sectional view of which is shown at B, Fig. 6. The body A is provided with a suitable shank which fits the turret hole. The tool-holder B is pivoted to the body as shown and is held in its central position by the loop spring C. The tool, the shape of which is clearly shown, is securely held in position by means of a block and the set screw indicated. In operation, the tool enters the work to the required distance, at which point the front cross-slide advances and acts upon the adjusting screw D. This action presses the holder B to the rear, at the same time causing the inverted tool to cut the desired depth of recess. Upon the completion of the work the tool is relieved by the cross-slide receding and is returned to central position by the action of the spring, which forces the holder back till the stop pin F is in contact with the plug E.

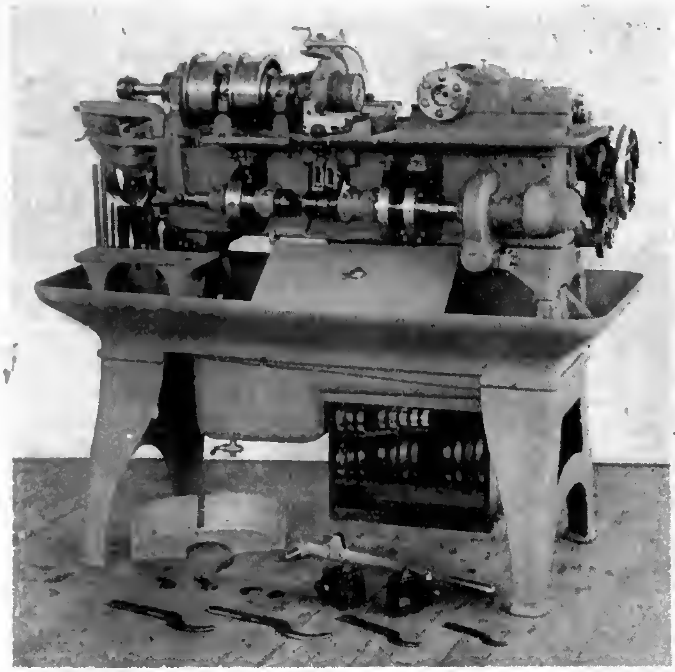


FIG. 3. BROWN & SHARPE AUTOMATIC NO. 2.

Threading and Trimming

Upon the completion of the cycle of operations included in operation I, the semi-completed gaine is ready for the next operation, which includes cutting the external thread and trimming to length. The machine used is of the same style as that used in the previous operation and it contains several interesting appliances which materially add to the output of the machine.

The work is fed into the machine through the stock feed tube inserted in the spindle and a magazine shown at A, Fig. 2. During the operation the feed tube is filled with gaines back to where an opening in the tube allows

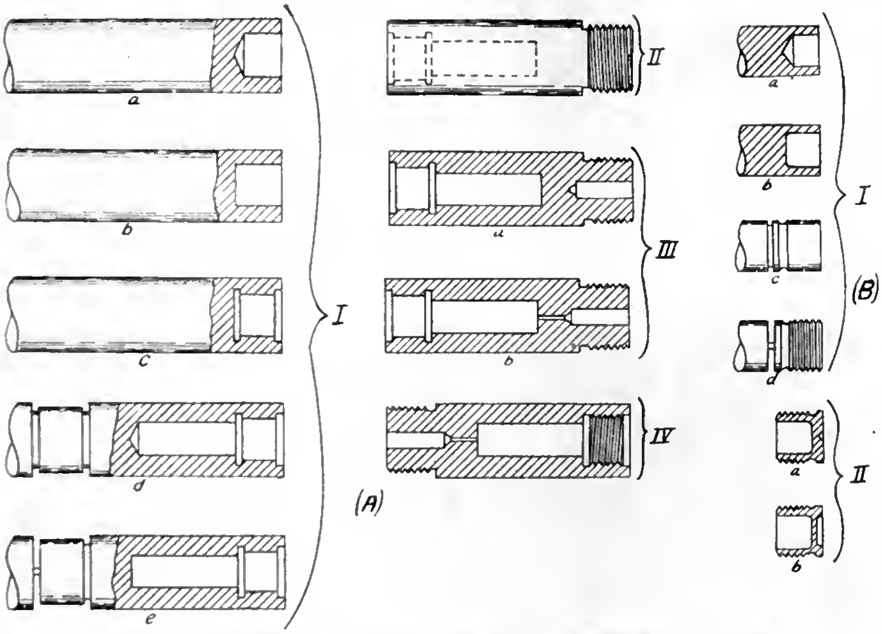


FIG. 5. SEQUENCE OF OPERATIONS ON GAINES AND PLUGS.

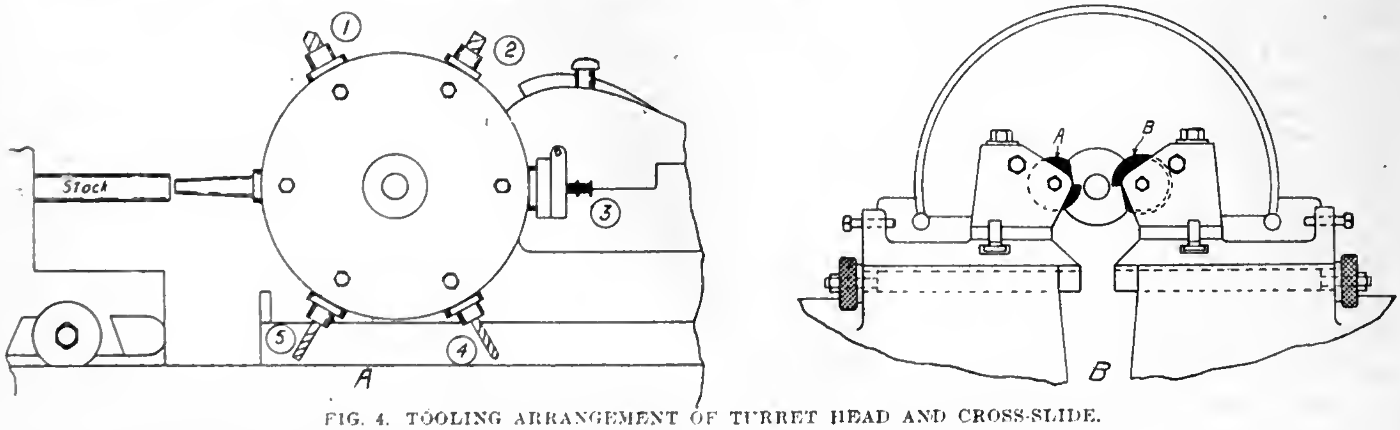


FIG. 4. TOOLING ARRANGEMENT OF TURRET HEAD AND CROSS-SLIDE.

them to drop in from the magazine, which the operator keeps filled with fresh pieces. When the chuck is released upon the completion of the operation the feed plunger advances beyond the slot in the tube forcing the finished gaine out, and at the same time causing another to take its place. The plunger then returns to its former position and as it leaves the tube slot open another piece is dropped in from the magazine.

Gauging Device

An excellent arrangement whereby the work, as it is fed into the chuck is gauged so as to be in proper relation to the thread milling cutter is shown in the foreground Fig. 7. The block A is secured to the rear cross-slide and the trigger-arm B is pivoted to it as shown. The latter acts against an adjustable stop C, which is clamped in the post E attached to the front of the block. In operation the device operates as follows: As the completed gaine is leaving the chuck the cross-slide advances to the required distance which allows the point of the trigger B to act as a stop against the shoulder of the following gaine. As the latter is being forced forward, the shoulder acting against the trigger advances it until it comes in contact with the stop pin C. This positions the work in the chuck and as the latter closes on the work the cross-slide recedes and when the point of the trigger is free of the shoulder the action of the springs shown forces it back to its original position against the stop pin D.

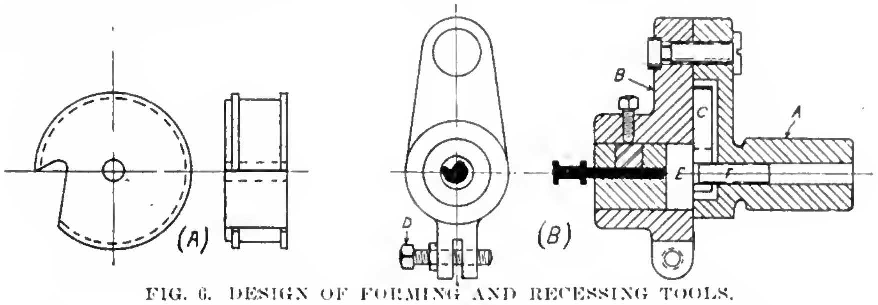


FIG. 6. DESIGN OF FORMING AND RECESSING TOOLS.

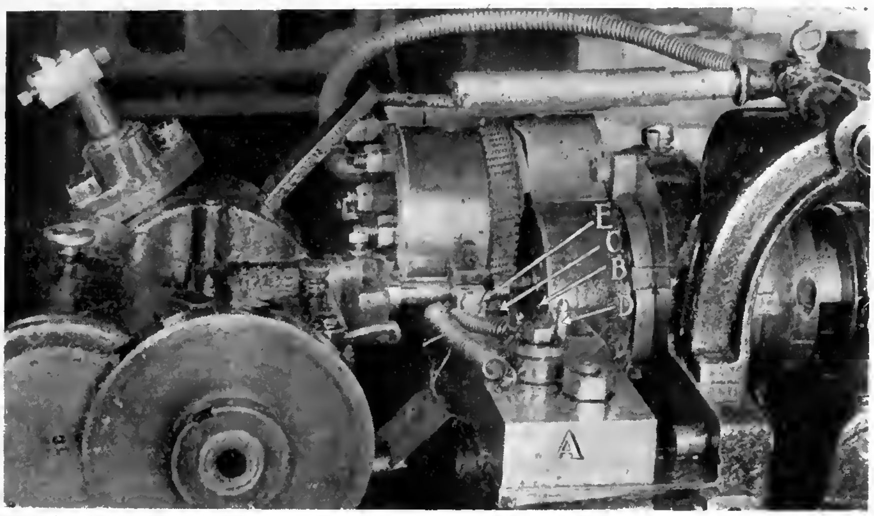


FIG. 7. LOCATING AND THREAD MILLING ATTACHMENTS.

The work being now chucked in the proper position the machining operations are next performed. These include milling the thread by means of the attachment, secured to the front cross-slide as shown, and also removing the centre burr and centring for the next drilling operation, and chamfering the end of the gaine by means of the tools shown secured in the turret head. Very little explanation of these operations is necessary, as they are clearly shown in the accompanying cut. The milling cutter is driven in the reverse direction to the work through a train of gears enclosed in the gear box placed to the left of the cutter. The reason for this method of driving the cutter is to insure that all unnecessary play which might occur would be taken up by the gears.

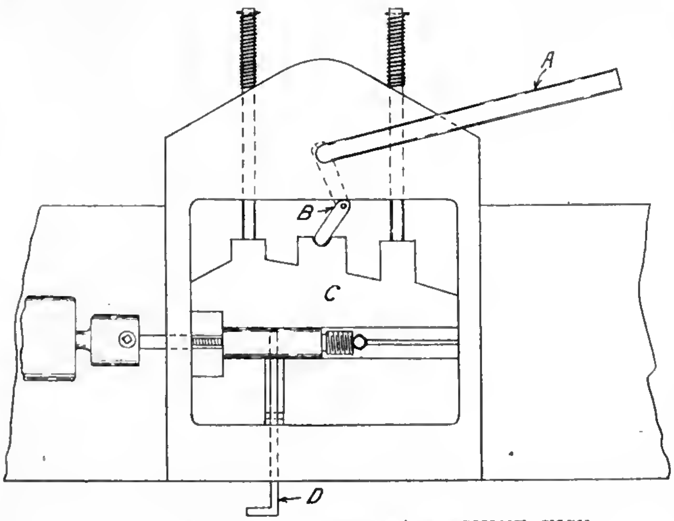


FIG. 18. PLAN VIEW TAPPING MACHINE VISE.

Leather Pads Preserve Work

With reference to the turret head arrangement this is fitted with three duplex tools similar to those shown, and three leather pads secured to the intermediate faces. These tools work in conjunction with the threading operation, as can be readily seen by referring again to the Fig. 7. As that thread is being milled as shown, the turret is advancing; the tools being shown as they are about to enter the work. Upon the completion of these operations all tools recede, the turret head rotating at the same time until the leather pad is opposite the work.

This pad acts as a cushion for the completed gaine as it is ejected from the chuck and prevents the threaded portion from becoming marred as it otherwise would should it come directly in contact with the turret head.

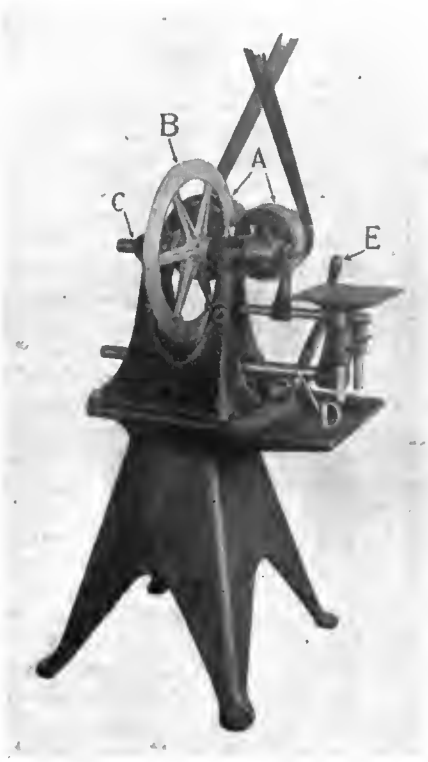


FIG. 9. RICKERT-SHAFER FRICTION TAPPING MACHINE.

The gaine, the outside diameter of which is now completed, next passes to a B. & S. semi-automatic on which the two remaining diameters, i.e., the top

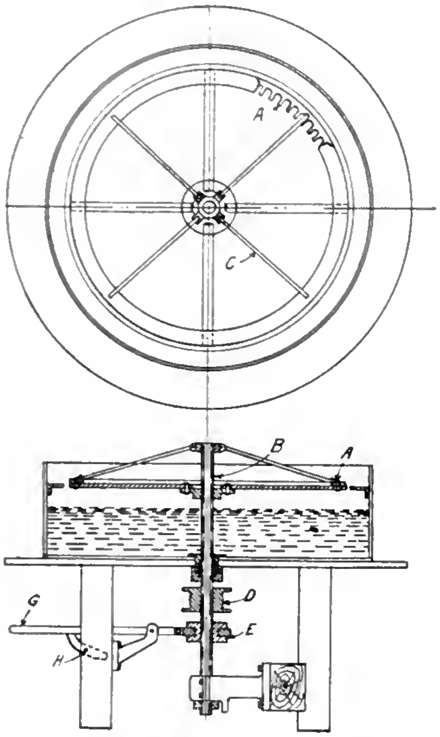


FIG. 10. PLAN AND SECTIONAL VIEW OF LACQUERING MACHINE.

chamber, and flash hole, are drilled and reamed. These operations need no explanation as the method of procedure is similar to the drilling operations used in operation I.

Tapping Diaphragm Chamber

To complete the gaine all that now remains is to tap the diaphragm chamber. This requires two operations, viz.: roughing and finishing.

The first of these is performed on a Garvin horizontal tapping machine which is somewhat similar in design to a small turret lathe. In place of the turret, however, a special chucking vise is used. A sketch showing the constructional features of this vise is shown by Fig. 8. In operation the gaine is placed in the position as shown and is securely held by means of the lever A operating through a toggle-joint B, the moveable vise jaw C. After the tapping operation the gaine is released by moving lever A, after which it is removed by pressing down on the ejector handle D. The ejector works on a pivot, thus, as the handle is pushed down the inner end of the ejector upon which the gaine rests, is raised.

The finish tapping operations are performed on Rickert-Shafer friction tapping machines which are particularly suited for this class of the work. By referring to the accompanying cut Fig. 9, an excellent idea of the possibilities of this machine will be obtained. The machine is driven by means of two friction pulleys A, driven by one belt, and which transmit the necessary forward and reverse motion to the spindle, through a large double-faced friction disc B attached to the latter. A considerable amount of thrust or end play is allowed the spindle C, and by this means the friction disc can be operated through either pulley as desired. The tap is held as shown, in a suitable chuck secured in the end of the spindle. In operation, the gaine is held in a convenient vise fastened to the machine table, and the motion imparted to the latter through the rack and pinion shown at D by means of hand lever E forces the work into the tap. The pressure thus exerted has the tendency to take up the thrust in the spindle until the disc is engaged with the forward drive pulley. Upon the completion of the tapping, the tap is relieved by exerting the reverse pressure on the hand lever which in turn causes the spindle to be relieved until the disc comes in contact with the reverse drive pulley.

Washing and Marking

Following the machining operations already described the gaines which are now practically complete are passed to the cleaning department, when all excess oil and cuttings are removed. After a preliminary bath in coal oil, the gaines are placed in large pails or callenders having a heavy screen bottom, and are placed in a kettle of boiling lye. After being subjected to a thorough cleansing they are removed and afterwards rinsed thoroughly in kettles of boiling water.. After being thoroughly rinsed a further precaution is taken to remove any chips by subjecting each gaine to a strong blast of compressed air.

The gaines now pass to the inspectors' room where, after being marked on a Dwight-Slate marking machine they pass through a rigid inspection as to lengths, internal diameter and size of threads.

Lacquering

Finally, after passing through the inspection department the gaines are ready for the last operation which includes lacquering, baking and packing. The first of these operations is taken care of on a special machine which although somewhat crude in construction is giving excellent service. A sketch of this machine is shown by Fig. 10, and as will be noticed it is somewhat similar in constructional and operating features to the ordinary oil extractor. The machine consists of a circular tank which is partly filled with lacquer and which is supported on substantially constructed legs. A circular rack A, which has accommodation for 64 gaines is secured to the upright shaft B, and is rigidly supported by stay rods C. The shaft is driven by means of a belt and pulley D, and can be raised or lowered by shifter E. The latter is operated by a lever G, which can be locked by the pin H, when the shaft is in its raised position. In operation the gaines are placed in position by being slipped over each respective lug, after which the shaft is lowered and the loaded rack immersed in the lacquer. After a thorough bath in this solution they are again raised to the former position and the lever locked in place, after which the rack is revolved at a high speed. The resulting centrifugal motion has the tendency to slightly raise the gaines permitting the excess lacquer to drain off, and causing the thin remaining coat to dry rapidly.

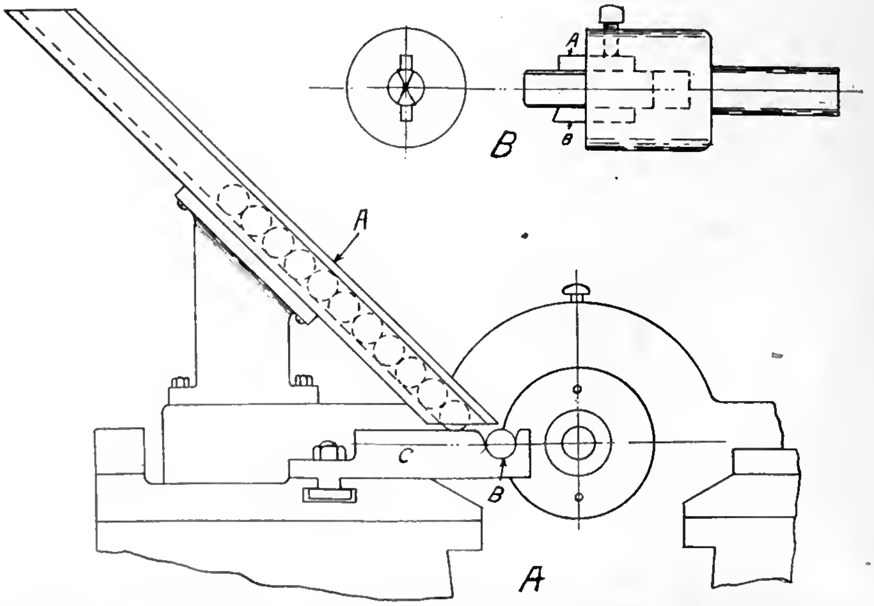


FIG. 11. (a)—MAGAZINE FEED ARRANGEMENT. (b)—REAMING AND FACING TOOL.

Baking

On being removed from this machine

the next operation in order is baking. This is accomplished on another very simple contrivance which consists of a long wooden box having a wire screen bottom. Beneath the screen are stretched several coils of electric heating wire. The gaines are placed in the box and passed slowly from one end to the other by which time they become sufficiently well baked.

The remaining and final operation consists of screwing the bottom plugs into place after which the completed gaines are wrapped and packed ready for shipment. In this case they are first wrapped separately by being placed in suitable card board cylinders after which they are packed in heavy wooden boxes, holding 500 completed gaines.

Bottom Plugs

The bottom plugs require but three machining operations, the first two of which are performed on B. & S. Automatics No. 0. The first operation consists of drilling, reaming and facing for length, by means of the turret tools while the cross-slide tools recess the end of the threaded diameter, thread the plug and cut off. The sequence of each respective operation is shown at B, Fig. 5.

The tooling arrangement of the turret needs no explanation beyond a description of the reaming and facing tool. A sketch of this is shown at B, Fig. 11, and it will be noticed that it really consists of three tools in one. The fluted reamer is held in a suitable shank which is also provided with slots to take the facing and chamfering cutters. A and B. The latter are so positioned as to insure the correct length being obtained. The cross-slide tooling arrangement consists of a combined recessing and cutting-off tool somewhat similar to that used in operation I on gaines, and a thread milling attachment secured to the rear cross-slide; similar in design to that previously described.

Magazine Feed

The second operation consists of removing the centre burr left by the cutting off tool, countersinking and reaming the desired counterbore. The only unusual feature about this machine is the special feeding attachment. This consists of a suitable magazine or trough conveniently located and secured to the body of the machine. This device is shown at A, Fig. 11. The magazine is filled from the top with the semi-completed plugs which are automatically released, one at a time into the recess B. which is formed in the block C, secured to the front cross-slide. When the plug is in position as shown by the sketch the cross-slide moves forward until the centre of the plug is in a direct line with the centre of the chuck. The turret then advances and a plunger secured to a turret face pushes the plug into position in the chuck The cross-slide then returns to its former position to receive the next plug while the one just deposited in the chuck is being machined by the turret tools.

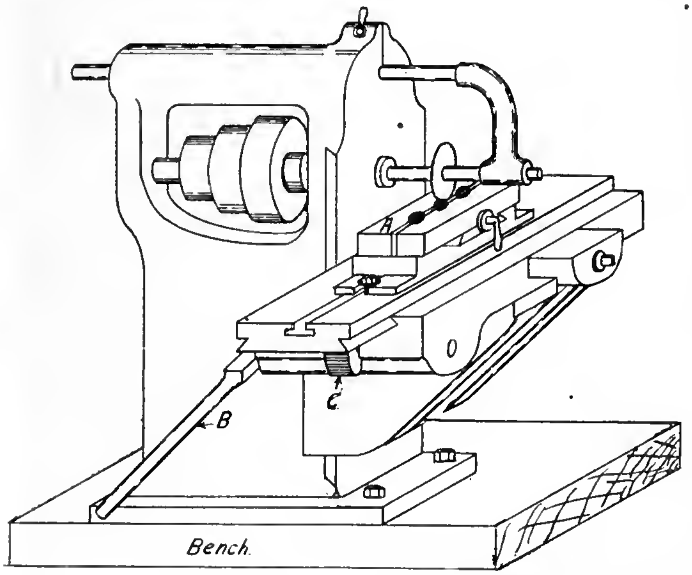


FIG. 12. SLOTTING PLUGS ON BENCH MILLING MACHINE.

Cutting Slots

The remaining operation which calls for the cutting of the slot is accomplished on a small bench milling machine, the details of which are shown by Fig. 12. Secured to the machine table is a vise A, which is constructed as shown to accommodate three plugs. These are placed in position and after being locked are slotted by being passed beneath the cutter. This machine is capable of slotting 250 plugs per hour.

All that remains now to complete the plugs is the operation which includes lacquering and baking. Both of these operations are performed on the same machines as are used in connection with the gaines: the only difference being the manner in which the plugs are held on the lacquering machine rack. The latter is so constructed that the space allowed between each respective lug is sufficient to allow the plugs to be slipped on and held snugly in position by the recessed diameter. When the desired number of plugs are in position, they are dipped in the lacquer, after which they are dried and baked in the same manner as the gaines.

TAPPING BLAST FURNACES

AT the Edgar Thompson works of the United States Steel Corporation, blast furnaces are tapped by a method devised by the engineering department of the Westinghouse Electric & Mfg. Co. An electric arc is drawn between an electrode and the chilled metal in the tap hole; the heat of the arc burns through the chilled metal until the fluid contents of the furnace are reached. If during the opening operation non-conducting material be encountered, it is necessary to stop the arc and drive a steel bar through this mass. The process of melting is then continued, the arc following this bar of metal. A 250-volt circuit is used, the pressure being reduced by means of a water rheostat. A current of from 800 amperes to 1,000 amperes is ample for the operation.

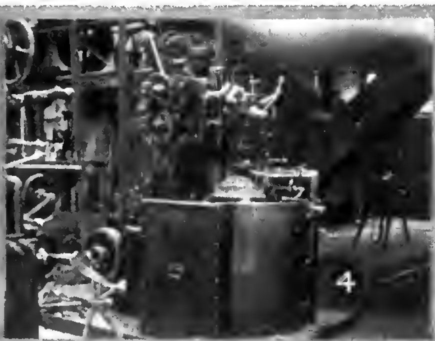
The apparatus required consists of a special electrode holder, electrodes, cable, a resistance, and a head shield or protector for the operator. The electrode holder consists of an iron pipe 4 ft. or 5 ft. long, in one end of which the electrode material is placed and clamped by means of a ring; the end of the pipe is split in order to give a clamping effect when the ring is forced down towards the end of the pipe. In the other end of the pipe a wooden pole is placed, the cable connection being made to the iron pipe. The entire length of the electrode and its holder is about 12 ft.

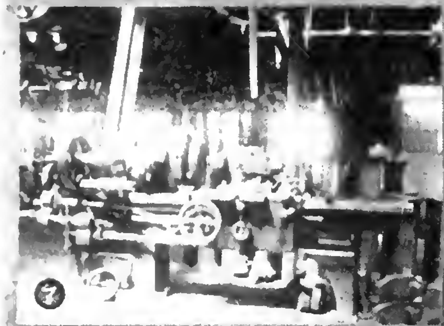
Steel articles that have been tempered or blued and show a light color, either straw or blue, cannot be tinned without first removing the thin film of oxide which gives color to the hardened and tempered steel. A bath of dilute hydrochloric acid is necessary to remove this thin film of oxide. It will require only a few seconds' immersion to do so, after which the object should be dipped into the lead and tin bath while wet. Place it immediately afterwards in the melted bath, and the lead and tin alloy will immediately coat the surface and form an excellent foundation for further soldering.

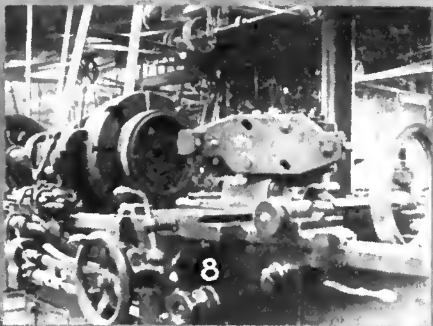
The extreme pressure at which open-hearth steel furnaces are being worked in Britain has caused rather a shortage in the supply of the silica bricks of which they are built. The output of the bricks is said to have fallen off by one-half, whereas the consumption has nearly doubled during the progress of the war.

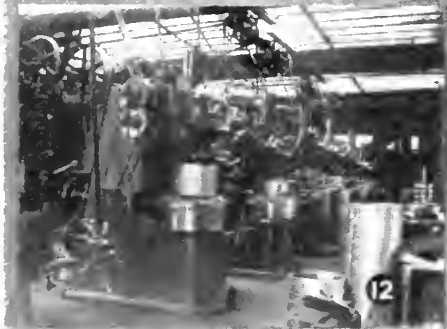
PRODUCTION METHODS AND DEVICES

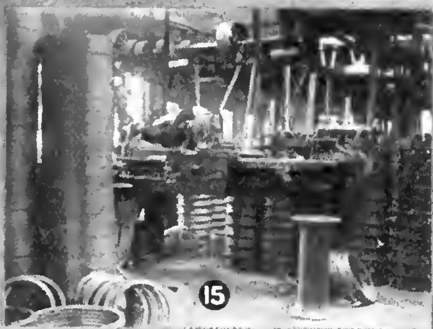
A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience











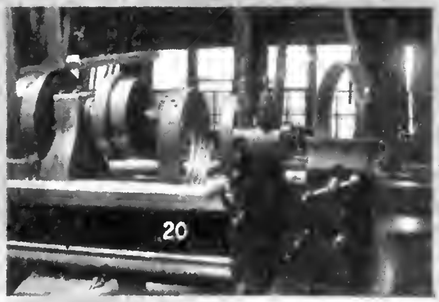


Fig. 3. Rough drilling valve rod hole in follower on Baker drill.
Fig. 4. Machining follower on Bullard vertical turret lathe.
Fig. 5. Cutting follower keyway on Baker key-seating machine.
Figs. 7 and 8. Turning and boring bull ring on Bullard horizontal turret lathe.
Fig. 9. Drilling body or spool on Slocum drill.
Fig. 10. Turning, facing and recessing body or spool on LeBlond lathe.
Figs. 12, 15, 18 and 20. Progressive stages in machining valve rings.

MACHINING AND ASSEMBLING ENGINE PISTON VALVES—II.

By George Black

Machining the body or spool is the next operation, and reference to Fig. 9, which is section through spool, will show that a bar of rectangular section, A, is cast in each end, the use of which is to carry the centres upon which the ends of the body will be turned; the bars are for machining purposes only and will be removed when the turning operation is completed. Although this method of handling the work entails a small increased cost both in extra metal and labor, it was found to be that which was most economical in the end.

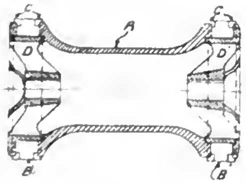


FIG. 1. SECTION THROUGH PISTON VALVE.

First Operation.

The first operation to the body is to mark out the centres and drill with a Slocum drill, and would consist of:

	Min.
(1)—Lay off and mark center	1.0
(2)—Set up in drill press	.5
(3)—Drill center	1.0
(4)—Remove	.5
(5)—Repeat for other end	3.0
	Min.: 6.0

Second Operation.

The body then passes to a 21-in. Le Blond heavy-duty lathe, where the ends are turned, faced and recessed for the bull-ring and follower fit. Fig. 10

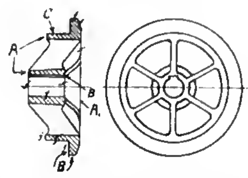


FIG. 2. SECTION THROUGH CENTRE OF FOLLOWER.

is a view of the lathe with the body in the centres, and the detail operations are:

	Rev. per min.	Feet per min.	Depth of cut.	Feet per rev.	Time in Min.
(1)—Lift from floor, place in centers					1.0
(2)—Set tool and cut					.5
(3)—Turn outside diameter	18	55′	1-32″	.025″	1.25
(4)—Reset tool and cut. Change feed					.5
(5)—Turn O. D. 2nd cut	18	55′	1-32″	.03″	1.00
(6)—Reset tool and cut. Change feed					.5
(7)—Rough turn face	18	55′	⅛″	.025″	3.0
(8)—Reset tool and cut					.5
(9)—Finish turn face	18	55′	1-32″	.025″	3.00
(10)—Change and reset tool and cut					.75
(11)—Rough turn recess	18	54′	3-16″	H.F.	3.00
(12)—Reset tool and cut					.5
(13)—Finish turn recess	18	54′	1-32″	H.F.	3.00
(14)—Reset tool					.25
(15)—Turn clearance	18	54′	⅛″	H.F.	1.5
(16)—Remove addage and smooth					1.0
(17)—Remove body. Clear chips					1.0
(18)—Repeat for other end of body					22.25
				Min.	44.50

Third Operation.

The bars in the end of the body, having served the purpose for which they were intended, are now removed and this

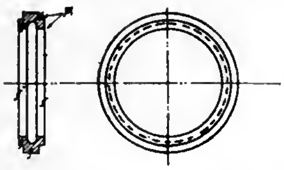


FIG. 6. BULL RING.

is best accomplished by drilling 1 ¾-in. hole through the bar at each end of same; the bar can now be knocked out and the rough spot on each side dressed up with a hammer and chisel. The time required for this work is 12 min., the details of which are:

	Min.
(1)—Mark each end of bar for drill and place in position	.75
(2)—Drill 1—¾″ hole. Note—Care required in going through	1.25
(3)—Reset for 2nd end	.25
(4)—Drill 1—¾″ hole	1.25
(5)—Remove body	.25
(6)—Break out bar. Dress up with chisel	2.00
(7)—Repeat for other end	5.75
Min.:	11.5

Piston Valve Rings.

With the exception of drilling at each end of the body for the dowel pin, which is handled by the fitters at the assembling bench, the body is finished and the remaining machine operations are those necessary for making the piston valve rings. These rings are of "L" section, as seen in Fig. 1, turned to 14 5-32 inches outside diameter, 7-16 in. cut out, closed with a 1-32 in. liner between the ends and re-turned to the same diameter as the bore of the valve

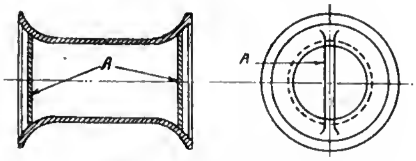


FIG. 9. SECTION THROUGH SPOOL.

bushing; they are usually made from hunt-spiller or gun iron metal, and are machined from hoops which have 3 lugs cast upon the bottom, Fig. 11; these lugs are used to clamp the casting to the face-plate, and in order to guard against the possibility of the lugs breaking off under the strain of roughing out the hoop, a driving plate is clamped to the face-plate and drives directly at the root of the lug. Fig. 12 shows this operation, but the driving plate is obscured by chips. Occasionally a lug is broken off the hoop, and in that event, a ¾-in. hole is drilled in the hoop about 1 in. above the lug, and a finger clamp, inserted in this hole, is utilized in the place of the lug for clamping purposes.

First Operation.

The first operation to the hoop consist of:

The 1st operation to the hoop consists of:—	Rev. per min.	Feet per min.	Depth of cut.	Feet per rev.	Time in Min.
(1)—Chuck and true up hoop					10.0
(2)—Set tool and cut					1.0
(3)—Face top of casting	18	57′	⅛″	.042″	1.0
(4)—Set tools and cuts					2.0
(5)—Rough turn O.D.) (6)—Rough turn I. D.)	18	57′	3-16″	.042″	16.0
(7)—Reset heads, tools and cuts. Change feeds					2.5
(8)—Finish turn O. D.) (9)—Finish turn I. D.)	18	57′	1-32″	.33″	3.0
(10)—Reset heads, tools and cuts. Change feeds					2.5
(11)—Recess top of casting	18	57′	3-16″	.014″	2.0
(12)—Change and set tools					1.0
(13)—Face recess to depth	18	57′	1-64″	.014″	2.0
(14)—Change and set tools and cuts. Change feeds					2.0
(15)—Part of ring	18	57′	⅜″	.007″) .014″)	2.0
(16)—Remove ring. File burrs					.5
Repeat items 12—16 inclusive for 9 other rings					67.5
Remove scrap. Clear chips					2.0
Total time for 10 rings:—Min.					117.0
Total time for 1 ring:—Min.					11.7

The above details require no explanation except item 15, "part off ring." In this operation the centre head and the side head are working, one from the inside and the other from the outside. The centre head carries a parting tool ⅜-in. wide, while the side head holds a parting tool ⅛-in. wide. The sketches, Fig. 13 and 13a, illustrate the way the tools are used; the wide tool carries double the feed of the outside or ⅛-in. tool, but having nearly double the resistance to travel, the time is about equally divided. It will be noticed that this method of parting off the rings leaves the following ring, with the step or recess roughed out and in item 13, "face recess to depth." this step is finished to gauge with the centre or turret head which carries a tool-holder equipped with tools as shown in Fig. 14.

Second Operation.

The ring now passes to the adjoining engine lathe, where it is skimmed up to width and to gauge on the second side; see finish mark, Fig. 17. This operation was found to be necessary and more economical than attempting to part them off the hoop correct to gauge. Fig. 15 shows the lathe and the adapter for holding the ring during this operation, and reference to Figs. 16 and 17 will explain the operation of same. The letters have reference to the component parts of the adapter; "A" is a heavy face-plate strongly ribbed to render the plate

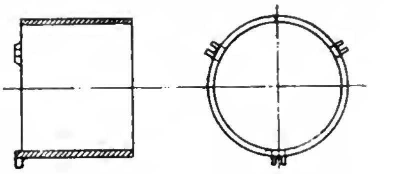


FIG. 11. PISTON VALVE RING CASTING.

rigid; "B" is a loose ring, the outside diameter of which is 1-16 in. less than the middle diameter of the piston ring E. This loose ring, B, is centered upon spigot C, and is of various diameters to suit the different piston rings; it has a cone

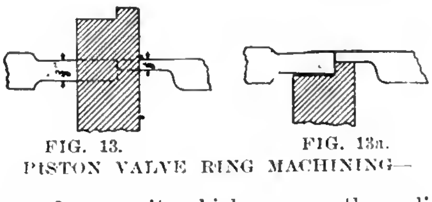


FIG. 13. FIG. 13a.
PISTON VALVE RING MACHINING—

turned upon it which causes the split ring D to expand into the piston ring E when forced up by the nut operating

upon Plate F. It will be readily seen that this arrangement chucks the piston ring true immediately; the finished face of the piston ring, taking up against the ring B, gives a parallel ring when the opposite side is faced off, while the split ring D holds the piston ring true on the outside diameter, grips firmly, yet without distorting the work. The details of this operation are:

	Rev. per min.	Feet per min.	Depth of cut.	Feet per rev.	Time in Min.
(1)—Chuck ring					.75
(2)—Face ring	14	50′	1-32″	.014″	3.75
(3)—Gauge and remove					.5
				Total time	5.0

In the above operation the saddle was locked in one position, while the cross slide was fed across the ring and then drawn back out of the way when placing a new ring in position; by this means, time spent in gauging the work was reduced to a minimum, the only adjustment necessary being due to the wear of the tool.

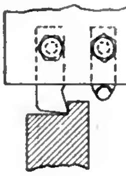


FIG. 14. PISTON VALVE RING MACHINING — FIRST OPERATION.

Third Operation.

The next operation to the ring is that of cutting out the amount necessary to give the required "spring." In this case the amount was 7-16 in. and while "ganging" and splitting on the milling machine gives good results, it means tying up a very valuable machine, hence it was decided to use an old discarded lathe for the job. Fig. (18) will give a general idea of the rigging, which consisted of a mandril upon which was mounted a pair of 6 in. diameter metal saws. The ring was placed upon a flat cast iron plate, which was secured to the top rest of the cross slide by a bolt in the plate of the tool post. The ring was centered on the plate by two 1/4 in. pins and securely clamped in one movement by the cam handle A, Fig. (19) a movement of which through about 90 degs. being all that was required. The clamping plate B, is pivoted on bolt C, which is provided with a knife edge washer and can be adjusted to suit varying thicknesses of rings, by the nut D, and also adjusts the movement of the cam handle. A coiled spring under the plate B, lifts the same away from the ring when removing or replacing rings. The capacity of this old lathe on this work, was 600 rings per day of 10 hours.

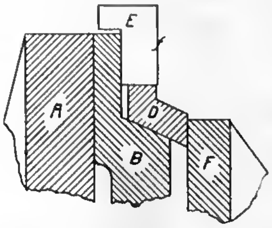


FIG. 17. PISTON VALVE RING MACHINING — SECOND OPERATION.

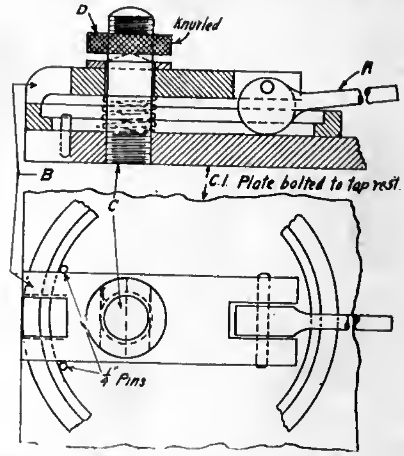


FIG. 19. PISTON VALVE RING MACHINING—THIRD OPERATION.

Fourth Operation.

The split rings now pass to the next lathe for the re-turning operation. In this operation it is necessary to draw the split piston ring together, until the ends butt against a 1-32 in. liner inserted between them, it is then clamped in this position and the outside diameter turned up to the required size. Fig. (20) shows the various parts of the rigging with which the lathe was furnished to handle this work. An adapter with spigot "A" the outside diameter of which corresponds with the bore of the piston ring, is screwed on the nose of the lathe; the 4 split piston rings are next placed in the clamping ring "B." a 1-32 in. liner inserted between the ends of the ring and by means of the bolt in ring "B." the whole are pulled up tight; they are then pushed over spigot A and the clamping plate "C" operated by the stud "D" pulls the 4 rings up snug against the shoulder at end of spigot "A," clamping ring "B" is now slacked off and removed by sliding over plate "C." leaving the rings ready for returning on the outside diameter. This operation is handled by the two tools as shown in Fig. (20), in which "E" is the roughing tool and "F" the square-nosed finishing tool. The cross slide is moved up to a positive stop giving the correct diameter, which eliminates much caliper measurements, and the saddle is operated through the usual friction feed while roughing the rings to diameter; when the diamond point tool has run off, the friction feed is disengaged and the lead screw nut dropped into gear and as the square nosed tool is following in tool post "F," the result is a fine finish and a ring to size. The detail operations are as follows:—

	Rev. per min.	Feet per min.	Depth of cut.	Feet per rev.	Time in Min.
(1)—Place 4 rings in band clamp and apply brass liner...					.25
(2)—Apply to jig					.75
(3)—Clamp and remove hand clamp					.75
(4)—Set tool and cut					.25
(5)—Rough turn	12	48′	1-32″	.02″	10.0
(6)—Finish turn	12	48′	1-64″	.125	1.75
(7)—Remove rings					.75
				Time for 4 rings:	14.75

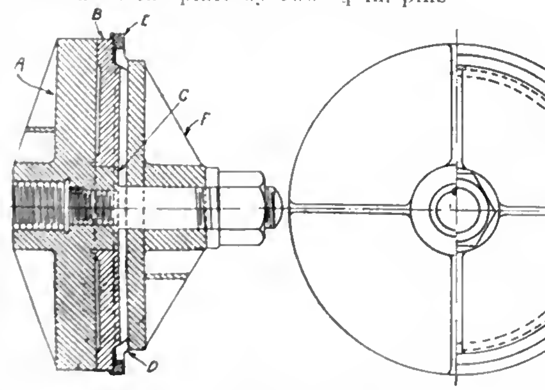


FIG. 16. PISTON VALVE RING MACHINING—SECOND OPERATION.

Final Assembly.

The component parts of the valve are now all ready for the assembly bench, where the work consists of drilling for dowel pins and fitting same, assembling the split rings, bull rings and follower together, fitting and marking the rings and finally bolting up complete with the body or spool. The output from two men would average 10 sets or 20 valves per day of 10 hours, when the operators were being paid on a piece-work basis.

J. W. Calder, assistant city engineer at Port Arthur, Ont., has been appointed town engineer and electrical superintendent of Swift Current, Sask.

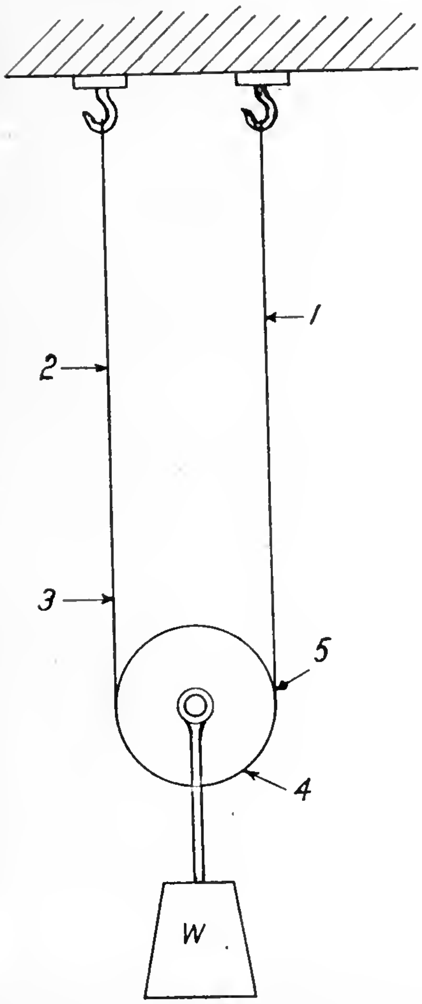
EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

ROPE STRAIN PROBLEM

By N. G. Near.

WITH reference to the query of J. R. H. under the above title in a recent issue, we all have doubtless known for a great many years



ROPE STRAIN PROBLEM. DIAGRAMMATIC PROOF OF SOLUTION.

that there is no difference in tension between Figs. 1 and 2, appearing there. This is true because of the old law of physics—"Action and reaction are equal and opposite in direction." Yet, that isn't a good answer. Just because a law says a certain thing it doesn't necessarily prove that the thing is right, for even laws may sometimes be wrong. It is stated, for example, that the well-known laws of gravitation aren't "absolutely accurate," but are very close—close enough for all practical purposes. Perhaps, as far as I know, they are "absolutely accurate." I am merely quoting others who have studied laws of gravitation more than I have and should therefore know more about them In consequence, we will assume for the present that the old "action and reaction law is wrong," and go after the "proof" which J. R. H. desires.

I rigged up a little device as shown in the sketch and instead of a rope used a string around the pulley. I applied load enough with my hands to break the string. I used five different lengths of string, all from the same ball, and noted the places where the string broke each time. In no test did the string break at the "middle" of the contact with the pulley. It broke in the places I have indicated by number, the numbers designating the number of the tests made.

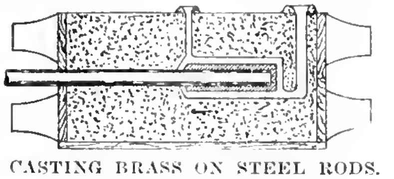
Since a string is fairly uniform in strength from end to end, and since my results are fairly uniform, I consider this pretty good "proof" that the tension is equal all over the rope or string, as the case may be, and that therefore no difference in tensions exist in the two figures accompanying the original query. The old "Action and Reaction Law" is also vindicated.

CASTING BRASS ON STEEL RODS

By B. R. S.

A foundry operation which is accomplished in many instances with no small amount of trouble is that of casting a brass covering or liner on steel rods, for use as pump plungers, etc. The difficulty lies chiefly in the fact that the castings are to a certain extent porous, resulting in a poor working surface when machined.

This difficulty can be overcome by casting two layers of metal on the rod, in which case the porosity of the first or inner layer will in no way effect the work. The rod should be cleaned bright, be absolutely free from rust, and by further washing with a solution of copper sulphate, thus covering it with a thin film of copper, better results will be obtained. The rod should also be heated to a comparatively high temperature in order to insure that the metal covering will not be chilled.



CASTING BRASS ON STEEL RODS.

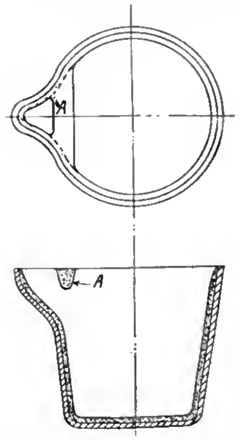
The method of pouring the second layer is shown in the accompanying sketch. In this case a wet sand mould is used, and it will be noticed that a suitable riser is employed, to draw off any dirt that may appear. A fairly high runner is used in order to maintain sufficient pressure to run the metal through in as short a time as possible.

Where the casings are thin, dried moulds faced with plumbago can be more profitably employed, as in such the metal runs better than in the ordinary wet sand mould. In both cases, however, the inner casing should be thoroughly scratch-brushed and the metal fluxed with dry zinc chloride.

TRICKS OF THE TRADE

By "Gov"

A serviceable skimmer that may be applied to either a hand or larger sulky foundry ladle, and which, in both cases gives good results by pouring off several



TRICKS OF THE TRADE—A LADLE SKIMMER.

heats without requiring a renewal, is shown by the accompanying sketch.

The skimmer consists merely of a clay bridge, A, constructed across the top of the ladle. In constructing the bridge, a strong clay mixture should be used, reinforced with wire or a piece of wood, until the clay is set, after which the bridge becomes self-supporting. In forming the pouring spout, a gate pin or any round plug of the desired size, is requisitioned, and around this the clay is worked up till the bridge is of the required shape.

Since a skimmer of this description can be constructed while the ladles are being "daubed up," the extra time and material required are of little or no consequence.

SHALL I BUY OR MAKE MY POWER?

By W. B.

THIS is an easy question to ask oneself, but not so easy to answer. We must first work ourselves into a state of

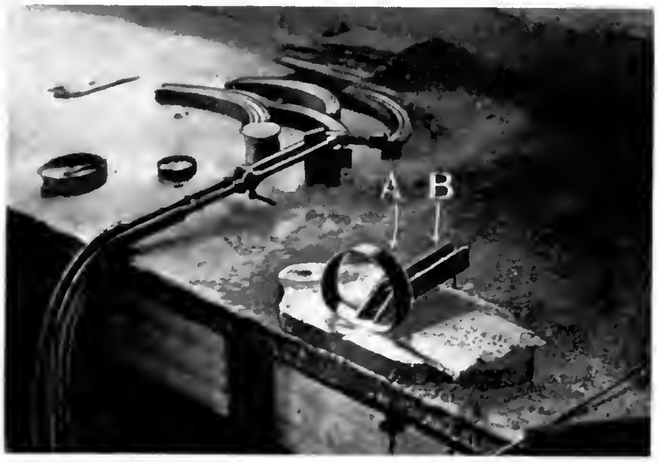
profound analysisitis and gain a clear understanding of first cost and the "ifs and ands" connected therewith. Perhaps it is first cost and then again, it isn't first cost at all.

Generally we are of the belief that the money we immediately "shell out" is first cost, but with a mortgage on the place, a small prepayment, and a promise to pay, it can sometimes be shown that there is no first cost at all. It is just added to the depreciation, subtracted from the sinking fund, divided by a safety factor and multiplied by two.

In the long run, after sifting the ashes, picking out the good coal, and playing a game of dice with them, we can decide the problem with the most sensible of logic.

A BRAZING CLAMP

THE clamp shown is used for holding small bands or hoops while brazing the ends together. The hoop is placed as shown at A, with the ends overlapping and the clamp B holding them down. The brazing is then done with the torch shown at the left. The clamp is held down by means of a spiral spring underneath the bench, and, when the work is to be released a foot treadle is pressed which pulls on a wire fastened to the back end of the clamp. This tips it up in front and releases the hoop



A BRAZING CLAMP.

BUYING AN ELECTRIC MOTOR

NOW that the demand for electric motors is so general, it often happens that an order has to be placed or a purchase effected by a person having little or no technical knowledge of electrical machinery. The non-technical buyer will much appreciate the hints which have been given by a well-known firm of machine tool makers for his guidance when making a selection of electric motors for works purposes.

It is of little importance whether the main frame of the motor is of iron or steel, but the feet should be planed, and laminated shoes fitted to the pole tips. The supports for the field coils should be so designed that the coils are firmly held, but at the same time there must be no sharp corners which would cut through the insulation by vibration. Obviously the shafts should be as stiff as possible, and oil throwers must be fitted to prevent any possibility of oil creeping along to the commutator and armature and affecting the insulation.

Ventilation should be provided in the armature so that the heat is evenly distributed, and this is usually obtained by means of ventilating ducts, both parallel and at right angles to the shaft. The armature cores are now all built up of laminated sheets insulated from each other, and having the conductors embedded in slots and held in position by strong steel bands, or in the case of large machines by wedges. It is desirable to have the commutators as large as possible in diameter in relation to the diameter of the armature, so that there are no bad bends in bringing the armature conductors into the commutator.

Armature Balancing

Very careful attention should be given to the balancing of the armature, particularly when the machine is required to be of the variable speed type for driving machine tools. Some buyers specify a certain radial wearing depth for the commutator sections. This radial wearing depth should not be too small, otherwise the commutator would need renewing at a comparatively early date, but on the other hand it is undesirable to specify too great a radial depth, as this puts up the cost of the machine unnecessarily. A good commutator will last as long as the machine, provided the machine is designed to run sparklessly.

The design of the bearings should not be niggardly, and it is very good practice to have two oil rings to each bearing, so that if by any chance one ring ceases to act the bearing is prevented from seizing. For ship-board use liberality in the design of the bearings is essential, and with two rings they should be so designed that during pitching or rolling at least one ring will be left free under any conditions to continue the lubrication. Most makers are now using the box type of brush gear, and it is a good feature to provide means of adjustment of the distance between the brush holders and the commutator, such that as the commutator wears down the same relation may be retained throughout.

Insulation

As regards insulation, the leading manufacturers now employ a special apparatus which exhausts all moisture from the insulator before forcing in under pressure the water-proofing varnish and, on general principles, a specified insulation resistance greater than one megohm should not be called for, as to obtain higher values a long baking at high temperatures may be required, which may permanently damage the insulating material. Breakdown tests should be applied, but in machines designed for moderate voltages a test pressure of three times the normal is sufficient.

The question of interpoles is one which is best left to the discretion of the manufacturers, but it can be taken for granted that, for variable speed motors, interpoles are necessary. In purchasing motors it must always be remembered that it is as essential to the manufacturer to know what his machine has to drive as it is for instance for the lathe maker to know what his customer requires the lathe to do.

Nickel and Acids.—Resistance of nickel to acids is considerably increased by the addition of from 5 to 10 per cent. of tantalum. An alloy of nickel with 30 per cent. tantalum can be boiled in aqua regia or any other acid without deterioration. The aloy is tough, easily rolled, hammered or drawn into wire.

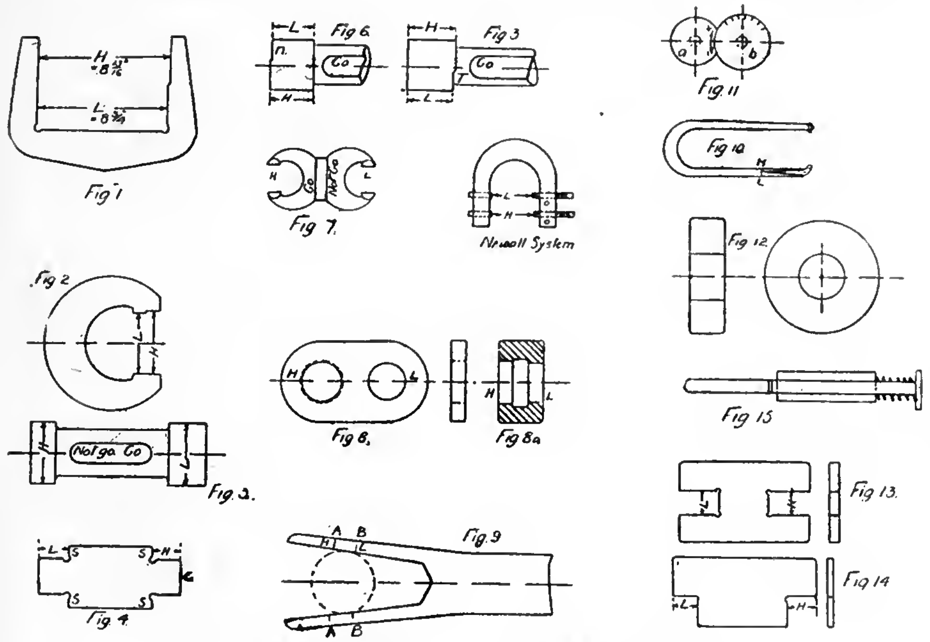
Tip to Business Men.—Ontario's Agent-General, Mr. Reid, who is in close touch with trade conditions, thinks that Canadian business men should not wait until the war is over, but should convene at once to formulate a policy on Imperial trade and submit it to the British Parliament, who says that suggestions should come from the Dominions.

Limit Gauge Principles and Practical Applications--I.*

By W. H. Booth, F.G.S.

As the author aptly remarks, there exists a real lack of grasp of the purpose of limit gauges, even although more or less appreciation may be evidenced by the great bulk of operatives that interchangeability of parts of a particular mechanism being manufactured is an indispensable condition. The writer deals with the various phases of the subject in such a way as to brush aside much of the mystery surrounding limit gauges generally and as will make their service application less irksome, as well as more effective of purpose.

LIMIT gauges have come very slowly into use, and are by no means yet generally understood. It may however be laid down in general terms that the limit gauge is essential to economical manufacturing on the interchangeable plan. The widespread interest in the production of munitions has brought the employments of the limit gauges very much to the front, for a shell is an object which, in spite of its short and merry life, is used in immense numbers, and should therefore be cheaply made, while at the same time quite interchangeable. A shell affords an excellent example of an article to be made as roughly as permissible, and yet as good as is imperative. This brings up at once a particular feature of the limit gauge system. A limit gauge is distinctly commercial. It is not designed for the purpose of producing specially fine work, as so many imagine. It is not a thing to be feared by the mechanic, but rather to be welcomed by him as an aid to rapid progress.



LIMIT GAUGES FOR VARIOUS SERVICES.

Elements of System

To understand the system in its elements, let the case of the building brick be considered. A brick is intended to occupy a space of 9 in. length in a finished wall. Its length should, therefore, be 9 in., less the thickness of the mortar joint. For good outside work the mortar joint should be thin. Suppose that anything from 1/8 in. to 1/4 in. be allowed. Then a limit gauge for inspecting bricks should be, as in Fig. 1, with the two dimensions of 8 7/8 in. and 8 15-16 in. This will ensure that mortar joints do not average more or less than 1/4 in. and 1/8 in. respectively.

Metal Work Application

Applied to metal work, even of the roughest description, the same principles will rule, but, of course, the amount of the clearance will be very much less. The illustration, however, shows that the term "limit" signifies the degree of departure of work from strict accuracy, and the system is based on the fact that absolute accuracy cannot be attained. Small departures from absolute accuracy can be worked to approximately, and may be regarded as accurate in the very finest machine work.

Accuracy is very difficult and expensive to attain, and it is useless to attempt it in commercial work. Practical men, therefore, fix upon the amount by which any dimension may be allowed to differ from the nominal size. Let this difference be, say 0.0001 of an inch either way. Then, for a piece nominally 2-in. diameter the gauge will have two gauging jaws, or two steps, as in Fig. 2, one measuring 2.001; the other measuring 1.999. All pieces must in consequence enter easily the 2.001 end, or step, and must fail to enter the 1.999 end. Thus, if properly worked to, the piece is not so far from nominal size as the gauge by which it is made.

This is one of the notable points of the limit gauge system, and it brings up another. There must be no attempt to fit the piece to the "go on" end, or high end, of the gauge, as any attempt to fit to the gauge destroys the advantages of the system, for it increases the cost of the work needlessly. Men fresh to the system do almost invariably attempt to fit to one end of a double gauge, fearing to miss the other end entirely, but with practice they learn to hit the mean very fairly. The "go on" gauge should drop easily upon the piece of work. Even with a limit of only 0.0004 the "go on" end can rattle on the piece, and the other end can still refuse to go on. Men can, in fact, work more closely than they think they can. They are afraid of the figures, but have better skill than they believe themselves to possess.

Since it is easier to vary an outside than an inside dimension, it is better to base a limit gauge system on uniformity of hole than of shafts, spindles, etc., which are turned or formed on machines like the lathe. To produce a true hole it may first be drilled through by a twist drill, and reamed out to size with a fixed reamer, followed by a very light cut of an adjustable reamer. A double-ended cylindrical gauge of the form of Fig. 3 is used for testing. The spindle to fit the hole is made to one or three or four nominal dimensions, according as the pieces go together, such as a shrink or hydraulic fit, a hammer fit, a push fit, or a running fit.

Varieties of Running Fit

There are at least three varieties of running fit in ordinary engineering work, class A, for fine work of the toolroom order; class B for work of the good steam-engine class; and class C for heavy machinery. Running fits require care-

*From a paper read before the Association of Engineers-in-Charge.

ful fixing of nominal sizes and tolerances, but these are matters for the manufacturer and depend very much on circumstances.

The object of the limit gauge system being to facilitate work, it appears at first sight that if it be desired to run a 2-in. shaft in a 2-in. hole, the hole should be exactly 2-in., and the shaft 1.99 in., if the oil space allowed 0.005 in. or half a hundredth all round the shaft. Suppose, then, that the hole is gauged by a plug gauge with one end 2.001. and the other end 1.999, and the shaft is turned up to fit between 1.989 and 1.991, then the slackest possible fit would be represented by the difference between 2.001 and 1.989 or .012. In certain work however, it will be found that the largest possible shaft diameter will actually be greater than the minimum possible hole diameter. In other words, the shaft would not enter the hole. Such crossed limits, as they are termed, are frequently found given on drawings.

Cross Limits — Inexperienced Operators

It has been already said that workmen fresh to the system will almost invariably tend to hug one of the limit dimensions. They will insist on fitting the turned shaft tightly in the gauge, and often so tightly that the piece is larger than the maximum unstressed gauge dimension. Similarly, they will bore the hole so small that the "go in" end will very nearly not "go in," it will be so tight. With crossed limits and green workers it will often happen that when such parts come to be assembled they will either not go together at all or they will fit far too tightly.

Experienced workers on the other hand make the "go in' and "go on" gauges quite slack fits without trenching upon the "not go" quality of the opposite end of the gauges, and, even with crossed limits, perhaps it will not happen once in a thousand cases that the largest and smallest pieces come together in assembling and prove to be misfits. Even when this does happen, the assembler puts one of the pieces aside, and picks up another piece instead. It may happen that one piece is actually rejected, but this is a small loss in comparison with the continuous gain due to the system. A piece thus rejected should be promptly destroyed if not remediable, and, usually, with small parts it does not pay to remedy an odd piece or two.

Mean Sizes Average

The foregoing, while it explains how apparently erroneous dimensioning is really good commercial practice, serves to illustrate the facts which make limit gauging a success, viz., that the parts gauged tend to average at mean sizes, and, by the doctrine of chance, probability or improbability, the extremes of two sets of parts do not meet. Obviously, if it often occurred that parts did refuse to assemble properly it would be necessary to reconsider the limits or to examine the gauges, or trace out the man who was responsible for hugging one limit—a fault of lack of confidence which is costly in gauges, for it leads to rapid wear of the gauge due to forcing it in or on, and so tends to intensify the mischief.

Limit Gauge Forms

Limit gauges take a wide variety of forms, some of the commoner forms being as follows:—

Fig. 4 is a depth gauge, one end of which is inserted into a drilled hole, and touches the bottom of the hole before the shoulders s s make contact on the top surface. The other end rocks on the shoulders s s, because the end C cannot reach the bottom of the hole. Therefore, the depth of the hole is somewhere between the length of the two ends.

Fig. 5 is a depth gauge which not only measures the "go in" diameter of the hole, but also the depth. A small shaving is taken off the shoulder at T, and the upper surface of the metal must stand above T, but below the unshaved remainder.

Fig. 6 shows a gauge which measures the tapped hole in a plate of metal, and the thickness of that plate of metal must be such that, while the end of the gauge may project through it, the shaved step N is below the metal surface. This shaving off or stepping is a very common way of marking limits.

In Fig. 7 is shown an ordinary double-ended snap gauge, one end to "go on" and the other "not to go."

Fig. 8 is the same gauge, single-ended, one jaw having the limit step cut across it, so that the gauge will drop upon a shaft, and must be stopped by the step from going further.

Fig. 9 shows a form of gauge which is sometimes employed. Its jaws are long and alligator-mouthed, and the work to be gauged must enter the jaws to some point between the lines A A, B B, ruled across the jaws. In a gauge of this description, the distance between the points of contact of the piece gauged and the two jaws is less than the diameter of the piece, and this fact must be allowed for when scribing the lines. The actual diameter of the circle gauged is D, and $D = C \times \tan \frac{Q}{2}$, where C is the distance between the jaws at the contact point, and Q is the angle of divergence of the jaws, or $D = C \tan a$ for $a = \frac{Q}{2}$

It is often desired to measure the thickness of a long cylinder. For this purpose, the gauge (Fig. 10) is like a long pair of pincers, the gauging points being placed at the end of the handles and the nipping ends being arranged so that a finger on one jaw indicates upon a graduated curve formed on the other jaw. This finger is usually made in the form of a multiplying lever, and the zero point of the scale may be the point marked by the finger when the wall is of the nominal thickness, any difference being shown by the deviation right or left of the indicator.

It is not necessary further to describe forms of fixed limit gauges which are used on work to be produced in large quantities. In a factory such as an engine shop there will always be a large amount of simple turned and ground cylindrical work and plain boring, also much breadth and thickness work also capable of limit gauge treatment. Upon the conditions of manufacture, the forms of gauges employed must largely depend, and it will frequently be the case that an adjustable gauge system will be cheaper to employ wholly or partially.

Adjustable Snap or Caliper Gauge

An adjustable snap or caliper gauge on the limit system is of the form of the usual C gauge with the gauging jaws extended to carry, on the one, a pair of fixed anvil points, and on the other, which is split, a pair of micrometer screws, the flat ends of which form the gauge points, and the body of each screw can be gripped in the split jaw by a gripping screw. The two screws can each be set, say, 2 in. from its opposing anvil point in the other jaw, by means of a standard setting block. In each screw face is a small drilled hole, into which fits the spindle of a little circular dial plate, as in Fig. 11.

One disc (a) is hollowed on the edge to fit the circle of the other disc (b), and (a) carries the zero point, while (b) is divided round its edge into one hundred divisions, each representing .00025 in., the pitch of the screw being .025 or 1-40th in. The dial can be set by estimation of the eye to .000125 in., and even to .0000625 with fair approximation, or, if necessary, the fixed dial (a) might be made to show even closer adjustment by means of a vernier scale on its edge.

This system of adjustable gauge and limit settings is the Newall system, and it is usual for each gauge to comprise a ½-in. range. Thus, a 1-in. size will have a screw range of ½ in. The 2-in. gauge extends to 2½, and so on, and a few gauges will fill the full range from 0 up to any desired size. It is not thought desirable to extend the screwing beyond the ½ in. Any possible error in the pitch of the screws is negligible, for the screw only comes into play when setting the small limits from the nominal size.

Mineral Production of Canada for Calendar Year 1915--II.

By John McLeish, B-A. *

The accompanying statistics have become available through the issuance of a preliminary report by the Department of Mines, Ottawa. Although subject to slight additions or modifications of detail pending final compilation at a later date, we believe a more than ordinary interest will be taken in the data presented, particularly on account of the war-created activity which has marked almost every section of Canada's mineral resources development.

IRON ore shipments in 1915 amounted to 398,112 short tons valued at $774,427, compared with 1914 shipments of 244,854 short tons valued at $542,041. The 1915 shipments included hematite 205,989 tons, roasted siderite 132,906 tons, and cobbed magnetite and concentrates 59,217 tons. The 1914 shipments included hematite 89,454 tons, roasted siderite 109,838 tons, and cobbed magnetite and concentrates 45,562 tons. In the Great Lakes area the same ore prices prevailed as in 1914 and 1910 which were the lowest recorded in many years. Mine operators report 93,444 tons of ore exported to the United States and 304,668 tons shipped to Canadian furnaces.

According to the records of the Customs Department exports of iron ore amounted to 79,770 tons valued at $206,823 and imports of iron ore to 1,499,722 tons valued at $2,320,066. Shipments of iron ore from Wabana Mines, Newfoundland, in 1915, by the two Canadian companies operating there were 686,451 short tons of which 620,128 tons were shipped to Cape Breton and 66,323 tons to England. In 1914 the shipments were 639,430 short tons, of which 422,920 tons went to Cape Breton and 216,510 to the United States and Europe.

Pig Iron

The total production of pig iron in Canadian blast furnaces in 1915 was 913,719 short tons, valued at approximately $11,592,819 as compared with a production of 783,164 short tons in 1914 valued at approximately $10.002.856. A large proportion of this production is used directly in the manufacture of steel and the values are in part estimated. The 1915 output shows an increase of 130,555 tons or 16.67 per cent. over that of 1914, and compares favorably with the average of recent years. Of the total production in 1915, 13,692 tons were made with charcoal and 900,027 tons with coke. Included in the ore charged to blast furnaces, there was 293,305 short tons from Canadian mines and 1,463,681 tons of imported ore. Of the imported ore approximately 840.587 tons came from Newfoundland.

The blast furnace plants, operated for varying periods of time, included those of the Dominion Iron & Steel Co., at Sydney, N.C., the Nova Scotia Steel & Coal Co., at North Sydney, N.S., the Standard Iron Co., at Deseronto, Ont., the Steel Co., of Canada at Hamilton, Ont., the Canadian Furnace Co. at Port Colborne, Ont., and the Algoma Steel Co. at Sault Ste. Marie, Ont.

There was also in 1915 a production in electric furnaces of 10,794 tons of ferro-alloys (chiefly ferro-silicon with a very small tonnage of ferro-phosphorus), valued at $753,486 as compared with a production in 1914 of 7,524 tons valued at $478,355. About two-thirds of the ferro-silicon production in 1915 was of 50 per cent. grade, and the balance was of 75 and 85 per cent. grade.

Pig Iron Exports and Imports

The exports during 1915 of pig iron were 17,307 short tons valued at $231,551 or an average per ton of $13.38, and of ferro-silicon and ferro-compounds 9,238 tons valued at $537,081, an average of $50.81 per ton, or a total of 26,545 tons valued at $768,632 as compared with a total in 1914 of 19,063 tons valued at $486,366. The imports were 47,482 tons of pig iron valued at $624,200, or an average of $13.15 per ton, and 13,758 tons of speigeleisen, ferro-manganese and ferro-silicon valued at $807,312. or a total of 61,240 tons valued at $1.431,512.

Electro Metals, Ltd., producing ferro-silicon, have considerably enlarged the capacity of their plant at Welland, Ont., to meet the increased demand for their product occasioned by the war. In addition to sales for Canadian consumption a large and important tonnage has been furnished to Great Britain, Russia and the United States.

Steel Ingots and Castings

The production of steel ingots and castings in 1915 including 5,626 tons from electric furnaces, was 1,020,335 short tons, as compared with a production in 1914 of 828,641 tons. The 1914 production included open-hearth ingots 608,383 tons; Bessemer ingots 203,184 tons; direct open-hearth castings 15,315 tons; and other steel castings 1,759 tons, these figures being a revision of those previously published.

Asbestos

The asbestos production in 1915 was obtained from the same field in Quebec as heretofore. The output was less than in 1914, but sales showed an increase of about 17 per cent. Stocks on hand at the end of the year showed a noticeable decrease. The total output in 1915 was 106,558 tons, as against 107,668 tons in 1914, showing a decrease of 1,110 tons or 1.03 per cent. The sales and shipments during 1915 were 113,115 tons valued at $3.491.450, or an average of $30.87 per ton. as against sales in 1914 of 96,542 tons valued at $2,892,266 or an average of $29.92 per ton. The 1915 sales were larger in quantity than those of 1914 by about 17 per cent. and in value by about 20 per cent. Stocks on hand at December 31st, 1915, were 22,052 tons, as compared with stocks on hand of 31,171 at the end of the previous year. The number of men employed in the mines or quarries and mills were 2,393 and the amount paid in wages was $1,089,976 as against 2,992 men employed in 1914 to whom was paid in wages $1,283,977. The total quantity of asbestos rock milled during the year is reported as 1,795.472 tons, which with a mill production of 102,571 tons shows an average estimated content of about 5.71 per cent. of asbestos fibre in the rock. The estimated content of fibre in rock milled in 1914 was 6.03 per cent.

Asbestos Sales and Exports

The total sales of crude asbestos in 1915 were 5,366.7 tons valued at $1,071,860, or an average of $199.72 per ton as against sales in 1914 of 4,147.9 tons valued at $773,193 or an average of $186.42 per ton. The total sales of mill stock in 1915 were 107,748 tons valued at $2,419,590 or an average of $22.46 per ton, as against sales in 1914 of 92,394 tons valued at $2,119,073, or an average of $21.64 per ton. There was also a production of asbestic of 25,700 tons valued at $21,819.

Exports of asbestos during the calendar year 1915 were 84,584 tons valued at $2,734,695. or an average of $32.45 per ton, as against exports of 81.081 tons in 1914 valued at $2.298.646 or an average of $28.35 per ton. There was also an export of asbestos sand amounting to 25.103 tons valued at $157,410. or an average of $6.27 per ton and of manufactures of asbestos valued at $125,003. Imports of asbestos manufactures for the year amounted to $168,894.

*Chief of Mineral Resources and Statistics Division, Mines Branch, Department of Mines, Ottawa.

Coal and Coke

Coal.—The total production of marketable coal for the year 1915 (comprising sales and shipments, colliery consumption, and coal used in making coke, or used otherwise by colliery operators), was 13,209,371 short tons valued at $31,957,757, as against 13,637,529 tons valued at $33,471,801 in 1914 showing a decrease of 428,158 tons, or 3.14 per cent. in quantity, and of $1,514,044 or 4.52 per cent. in total value. In estimating the values of the coals, arbitrary values are assumed for the Nova Scotia and British Columbia production viz.: $2.50 per long ton for the former and $3.50 per long ton for the latter. The values used for coal production in the other provinces are those furnished by the operators.

The Nova Scotia production was 7,429,888 tons, an increase of 58,964 tons, or 0.8 per cent. over that of 1914: the Alberta production 3,320,431 tons, a decrease of 362,584 tons, or 9.8 per cent.: the British Columbia production 2,089,966 tons, a decrease of 149,833 tons, or 6.7 per cent.; the Saskatchewan production 236,940 tons, an increase of 4,641 tons, or about 2 per cent.; the New Brunswick production 122,422 tons, an increase of 24,373 tons, or 24.85 per cent.; and Yukon Territory, a production of 9,724 tons, a decrease of 3,719, or 28 per cent.

Coal Exports and Imports

The exports of coal in 1915 were 1,766,543 tons valued at $5,406,058, as compared with exports of 1,423,126 tons in 1914 valued at $3,880,175, an increase of 343,417 tons or 2.41 per cent.

The imports of coal in 1915 were made up as follows: Bituminous round and run of mine; 6,106,794 tons, valued at $7,564,369, or an average of $1.24 per ton; bituminous slack 2,286,916 tons valued at $2,027,256, or an average of $0.89 per ton; and anthracite 4,072,192 tons valued at $18,753,980, or an average of $4.61 per ton, making a total of 12,465,902 tons valued at $28,345,605.

Imports during 1914 included bituminous, round and run-of-mine 7,776,415 tons valued at $14,954,321 or an average of $1.92 per ton; bituminous slack 2,509,632 tons valued at $3,605,235, or an average of $1.43 per ton; and anthracite 4,435,010 tons valued at $21,241,924 or an average of $4.79 per ton, making total imports of 14,721,057 tons valued at $39,801,498.

The above figures show that in 1915 there was a decrease from imports of the previous year in quantity of 2,255,155 tons, of 15.3 per cent., and in value of $11,455,893, or 28.78 per cent. The larger decrease in value is due to the average value of bituminous, round, and run of mine dropping from $1.92 per ton in 1914 to $1.24 per ton in 1915, and that of bituminous slack from $1.44 to $0.89. The details of the decreases in imports are as follows:—In bituminous, round and run-of-mine 1,669,621 tons or 21.5 per cent.: in bituminous slack of 222,716 tons, or 8.9 per cent.; and in anthracite of 362,818 tons or 8.2 per cent. The apparent consumption of coal during 1915 was therefore 23,849,040 tons, as against a consumption the previous year of 26,852,323 tons. Canadian mines contributed 48 per cent. of the domestic consumption, and the balance was imported. The total Canadian production was equivalent to about 53.4 per cent. of the consumption.

Coke.—The total output of oven coke during 1915 was 1,200,766 short tons made from 1,856,393 tons of coal of which 1,425,172 tons were of domestic origin and 431,221 tons were imported. The total quantity of coke sold or used by the producers during the year was 1,168,921 tons valued at $4,253,536 or an average of $3.64 per ton. In 1914 the total output was 1,015,253 tons, and the quantity sold or used by the producers was 1,023,860 tons valued at $3,658,514 or an average of $3.57 per ton. Returns for 1915 show a production of 0.647 tons of coke per ton of coal charged, as compared with 0.658 tons of coke per ton of coal charged in 1914.

Provincial Coke Output

The output of coke by provinces in 1915 was as follows: Nova Scotia 584,993 tons, an increase of 239,113 tons over 1914 production; Ontario 316,211 tons, a decrease of 61,303 tons; Alberta 24,187 tons, a decrease of 4,354 tons; and British Columbia 275,375 tons, an increase of 12,057 tons. The Ontario production was entirely from imported coal. By-products from coke ovens which included 10,448 tons of ammonium sulphate, 7,365,931 gallons of tar, and 4,089,602 thousand cubic feet of gas, made in 1915 were in excess of the production in 1914; there was also for the first time a production of benzol and associated compounds. The production of trinitrotoluene near the close of the year was reported by Col. Carnegie of the Shell Committee, as 100,000 pounds per week

The ovens operated during the year were those at Sydney, Sydney Mines and Westville, N.S., Sault Ste. Marie, Ont., Coleman, Albert, and Fernie, Michel, and Union Bay (Comox), British Columbia. At the close of the year there were about 1,742 ovens in operation, as contrasted with only 797 in operation, at the end of 1914. Over 800 ovens at Stellarton and Londonderry in Nova Scotia; Port Arthur, Ont.; Lille and Passburg, Alberta; Carbonado and Hosmer, British Columbia, were idle throughout the year. Imports of coke during 1915 amounted to 637,857 tons valued at $1,608,464, and exports were 35,869 tons valued at $160,053.

TRAVELLING WORKSHOP FOR MOTOR AMBULANCES

THE latest type of travelling workshop has been designed and built under the supervision of the R. A. C. Engineers' Department for the British Red Cross Society, and is described in a recent issue of the "Car." At least one of these workshops accompanies each convoy of motor ambulances, and it is explained that within the next few weeks there will be about twenty of these indispensable vehicles in actual use in France, Belgium and Italy. The whole of the near side can be raised when required to form a roof to protect the workers from the weather. As soon as this roof is fixed in position a hinged flap can be lowered and supported in such a way that the floor space is doubled. This enables the men to work from either side of the bench.

Special attention has been paid to the lighting, which is in duplicate—acetylene gas and electric light. Shear legs are provided at the back, and are used in conjunction with a 15-cwt. pulley block for hoisting the engine out of the frame, or in the case of a complete breakdown the front of the disabled vehicle can be lifted off the ground, and it can then be towed away on its rear wheels. In practice this shear leg attachment has been found to be one of the most useful fittings of the workshop. At the back of the car is an extra wide and strong step, and on this a large vise is permanently fixed. This step forms a useful rough bench, and is much appreciated by the mechanics in charge.

The tool equipment includes a 6-in. hollow mandrel lathe, a ½-in. vertical drilling machine, a double wheeled emery grinder, and a 400-watt charging and lighting dynamo. These are driven by a three horse-power vertical two-stroke petrol engine. There are also a rivet forge, a brazing pan, large and small petrol blow lamps, small hand tools of all kinds, various sizes of round, square and hexagon steel—mild and nickel—key steels, brass and steel tubing, brass sheet and copper sheet, and a large supply of nuts, bolts and washers. The body is mounted on a three-ton commercial chassis, and the weight of the complete vehicle is about 4½ tons.

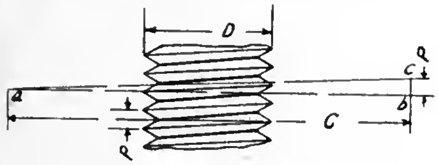
Stellite.—Stellite is not steel, it contains neither iron nor carbon, but is a tungsten. It is entirely unaffected by any degree of heat that can be generated by cutting, and, it is claimed, will maintain its edge at speeds which no high speed steel can stand, as well as be used on materials which high speed steel will not cut. Stellite must be held in a tool holder, as it is of a brittle nature.

Series of Practical Questions and Answers for Mechanics

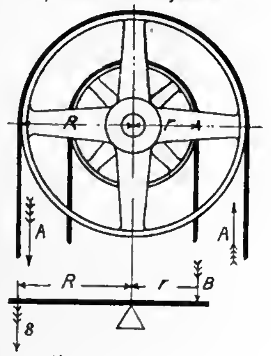
Every care is being taken to include only pertinent practical questions, and give same direct, reliable answers. Catch questions will be avoided. Arithmetic, consisting of simple addition, subtraction, multiplication and division will be found a useful companion study.

Question.—When we have been turning small shafts of a length exceeding twelve times the diameter, we have often been troubled with the shaft being out of true. How can this be avoided?

Answer.—When turning shafting, the heat that is generated by the action of the cut has a tendency to elongate the



Inclined plane, wedge & screw.



Pulley & Lever.

shaft. This is more perceptible in small work, and it is often necessary to release the pressure on the tailstock centre to avoid undue strain in the metal. When the work is long and light, the tendency is to distort the shaft, and in the case of heavier work the action is directly against the centres; this pressure will then cause tailstock centre to cut into the metal, and if the density is not uniform, the centre will wear eccentric to the shaft circumference.

* * *

Question.—What is meant by the elementary mechanical powers?

Answer. — Original works on mechanics state that there are five mechanical powers—that is, the inclined plane, the wedge, the screw, the lever, and the pulley. However, by closely observing the accompanying sketch, it will be clear that in reality these five powers can be placed in two classes—that is, the wedge or inclined plane and the lever. In the top sketch the triangle a b c forms a wedge, the angle c a b forms the inclined plane, and this angle also is that derived from the development of the screw shown, where D is the diameter, c b equal to the pitch, and a b equal to the circumference C. In the pulley and lever sketch the similarity is shown between the two powers. The arrows A indicate the direction of motion and the arrows B indicate the direction of force and resistance, and the radii R r of the pulleys represent the two arms of the lever.

* * *

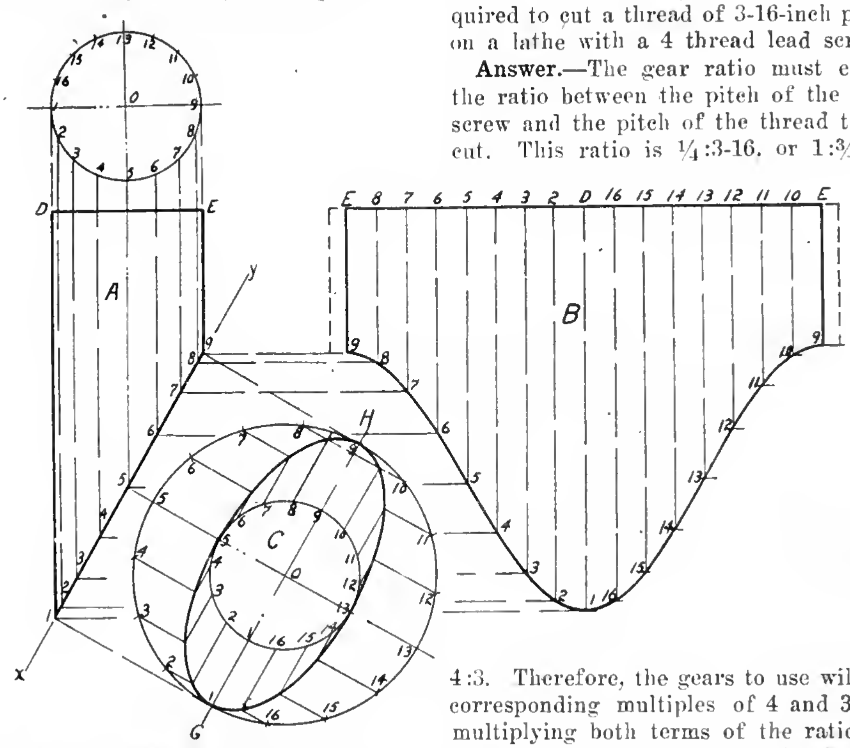
Question.—Is it any advantage to use oil when drilling or tapping cast iron?

Answer.—The drilling of cast iron is best accomplished when no oil is used, when conditions are normal, dry drilling is always to be preferred. When tapping cast iron many mechanics prefer to use no oil, and in many cases this can be considered good practice. However, the use of oil is not objectionable, provided it is of a good quality of light oil and only a few drops used to lubricate the teeth, but in no case is it advisable to use oil profusely.

* * *

Question.—A round pipe 10 inches in diameter is to be fitted to a roof, having a pitch of 60 degrees with the horizontal. What would be the shape of the opening in the roof, and also the shape of the pipe before being rolled?

Answer.—To determine the correct shapes and dimensions it is necessary to develop the outline upon the flat stock. First, draw a side elevation, as shown at A, the line x y forming the angle of 60



degrees and D E representing the diameter of the pipe. Directly above draw a circle, representing a plan of the pipe, and divide it into any number of equal parts, in this case sixteen. From these divisions, project lines, cutting the line x y as shown.

To find the shape of the roof opening, draw the line G H parallel to the line x y and some distance to the right. From the point 5 draw a line perpendicular to x y, and cutting the line G H at 0. From the point 0 draw two circles—one with a diameter equal to that of the pipe and a larger one with a diameter equal to the distance 1, 9 on the line x y. Divide these circles into the same number of equal divisions, and from these points project lines until they intersect as shown. The curve drawn through these intersections will give the outline of the roof opening. (All intersections must be from corresponding divisions).

To develop the blank B, first draw the line E E in line with the top of the pipe elevation, and divide it into 16 equal divisions. The intersection of the vertical projections of these points and the horizontal projections of corresponding points on the line x y will give the points through which to draw the curve, so that when rolled the pipe will fit the slope of the roof and sit in a vertical position.

* * *

Question—What gears would be required to cut a thread of 3-16-inch pitch on a lathe with a 4 thread lead screw?

Answer.—The gear ratio must equal the ratio between the pitch of the lead screw and the pitch of the thread to be cut. This ratio is $\frac{1}{4}$:3-16, or 1:$\frac{3}{4}$ or 4:3. Therefore, the gears to use will be corresponding multiples of 4 and 3, or multiplying both terms of the ratio by the same number, we obtain the desired gears. Thus: $4 \times 10 = 40$ and $3 \times 10 = 30$, or $4 \times 16 = 64$ and $3 \times 16 = 48$. Then 40 and 30 or 64 and 48 would cut the re-

quired thread. To determine the studs upon which the respective gears should go, always remember that the threads per inch on the lead screw multiplied by the gear on the lead screw must equal the gear on the spindle multiplied by the threads per inch on the work. In this case $4 \times 40 = 5\ 1\text{-}3 \times 30 = 160$. Therefore, the 30-gear will go on the spindle stud and the 40-gear on the lead screw.

* * *

Question.—A grinding wheel is specified to run at a surface speed of 4,000 feet per minute. If the wheel is 10 inches in diameter and running at a speed of 1,475 revolutions per minute, what should the speed of a 4-inch diameter shaft be to meet the surface speed condition?

Answer.—Surface speed of grinding wheel equals $\frac{10 \times 3.1416}{12} \times 1{,}475 = 3{,}862$ feet per minute.

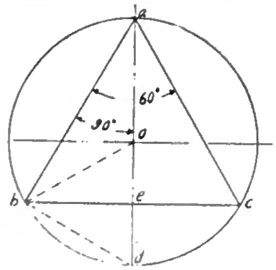
Surface speed of shaft being ground, will then be 4,000 minus $3{,}862 = 138$ feet per minute. Therefore, speed of 4-inch shaft will be 138 divided by circumference, or $138 \div \frac{4 \times 3.1416}{12} = 131$ revolutions per minute.

* * *

Question.—What would be the length of a side of an equilateral triangle that could be enclosed by a 9-in. circle.

Answer.—The length of the side will be .866 times the diameter of the circle, or $9 \times .866 = 7.794$ inches.

To find by calculation we proceed as shown in the sketch. As the sides of the triangle are all the same length, it follows that the distance b e will be one-half the length b c. Now as the triangle b o d is also equilateral, the distance o e will equal e d. Then $b\ e = \sqrt{[(b\ o)^2 - (o\ e)^2]} = \sqrt{(4.5^2 - 2.25^2)} = \sqrt{15.1875} = 3.897$ inches. Then length of side $b\ c = 3.897 \times 2 = 7.794$ inches.



* * *

Question.—A large pipe is required to carry away the discharge from 20 1¼-inch pipes. Allowing 5 per cent. over capacity, what would be the diameter of the large pipe?

Answer.—The area of each 1¼-inch pipe would be $1.25^2 \times .7854 = 1.227$ sq. in. Then 20 pipes would have a total area of $1.227 \times 20 = 24.54$ sq. in. With an over allowance of 5 per cent. the area of large pipe should be $24.54 \times 1.05 = 25.767$ square inches. Therefore, diameter of large pipe should be $\sqrt{\frac{25.767}{.7854}} = \sqrt{32.81} = 5.72$ inches.

* * *

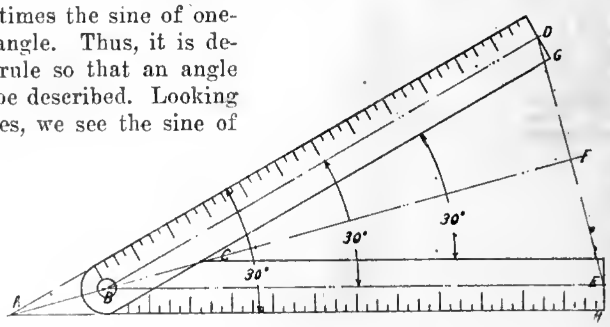
Question.—A large casting is placed in a tank of water, and it is found to raise the level of the water 4 inches. If the dimensions of the tank are 8 ft x 6 ft. x 5 ft. deep, what is the approximate weight of the casting when the specific gravity of the metal is 7.21?

Answer.—The volume of water displaced by the casting would be $8 \times 6 \times \frac{4}{12} = 16$ cu. ft. One cubic foot of water weighs 62.5 lbs., then the approximate weight of the casting will be the weight of water displaced, multiplied by the specific gravity of the metal, or $62.5 \times 16 \times 7.21 = 7{,}210$ lbs.

* * *

Question.—How can a two-foot hinged rule be used to determine the size of an angle?

Answer.—With the use of a table of sines any desired angle can be formed by opening the rule so that the distance D E will equal 24 times the sine of one-half the required angle. Thus, it is desired to open the rule so that an angle of 30 degrees can be described. Looking in the table of sines, we see the sine of 15 degrees to be .25882; then multiplying this by 24, we obtain 6.2 inches for the distance D E. As the points D and E may be inconvenient to work from, it would be better to measure from the points G and H. Any desired angle may be very accurately determined by this means. However, for general use the table here given may be of service:



Degrees	Length D E in inches	Degrees	Length D E in inches
5	1.04	50	10.12
10	2.09	55	11.08
15	3.12	60	12.00
20	4.17	65	12.89
25	5.21	70	13.76
30	6.21	75	14.61
35	7.20	80	15.43
40	8.21	85	16.21

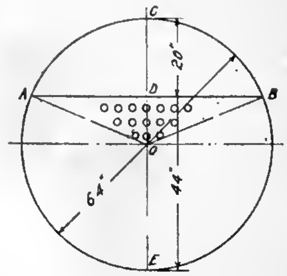
* * *

Question.—At what speed should a belt be run to obtain the best results?

Answer.—Existing conditions will have much to do with the speed of belting, but the generally accepted speed at which maximum economy and efficiency is shown is about 4,000 feet per minute.

Question.—A horizontal return tubular boiler, 64 inches in diameter and 16 feet long, is filled with water to within 20 inches of the top. What is the approximate steam space and quantity of water if boiler contains 160 2-inch tubes?

Answer.—As shown by the sketch, the volume of the steam space will be



the area of the segment A C B multiplied by the length of the shell. The length of the line A B can be found from the equation C D : D B = D B : D E, or $(D\ B)^2 = C\ D \times D\ E = 20 \times 44 = 880$; then $D\ B = \sqrt{880} = 29.66$ inches.

The area of the triangle A O B equals $29.66 \times 12 = 355.92$ sq. in. To find angle D O B, use the formula, cosine $= \frac{\text{side adjacent}}{\text{hypotenuse}} = \frac{12}{32} = .37500$, and the angle corresponding is 68 degrees. Therefore, angle A O B = 136 degrees. Area of boiler head $= 64^2 \times .7854 = 3217$ sq. inches.

Area of sector A O B C $= \frac{136}{360}$ of $3217 = 1{,}215$ sq. in.; then area of segment $= 1215 - 356 = 859$ sq. in.

Volume of steam space $= \frac{859}{144} \times \frac{16}{1} = 95.44$ cu. feet.

Volume of 160 two-inch tubes equals $\frac{2^2 \times .7854 \times 16 \times 12 \times 160}{1728} = 55.87$ cubic feet.

Volume of water equals $(\frac{2358}{144} \times \frac{16}{1}) - 55.87 = 206.13$ cub. feet.

Quantity of water in U.S. gallons will approximate $7.48 \times 206.13 = 1542$ gallons.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

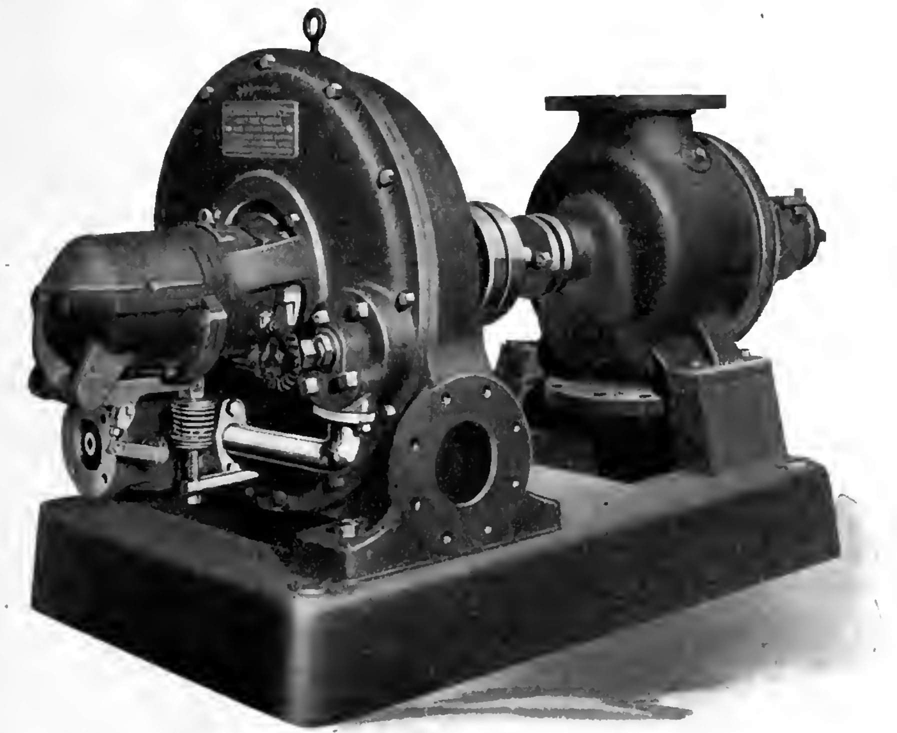
STEAM TURBINE DRIVEN, LOW LIFT CENTRIFUGAL PUMP

THE illustration shows a low lift centrifugal, turbine-driven pump recently supplied to the Canadian Salt Co., Windsor, Ont., by the Goldie & McCulloch Co., of Galt, Ont., for condenser service in connection with the 800 k.w. triple expansion, vertical quick revolution engines also supplied by the same concern. It is capable of delivering 1,000 U.S. gallons per minute against a total head of 40 feet when running at approximately 2100 r.p.m. Under these conditions the makers of the pump guaranteed an efficiency of 60 per cent. with a maximum b.h.p. of 16.85 at pump coupling. A flexible coupling connects the pump to a steam turbine of 20 b.h.p. when operating at about 140 pounds gauge and with back pressure of 5 lbs. gauge.

The pump is of the Rees-Roturbo pattern, the design of which is exceedingly simple, consisting of a pressure drum rotating in a casing at moderately high speed. This pressure drum is mounted on a central horizontal shaft mounted in ring-oiled, babbitted bearings. There are no moving parts in contact except at the bearings, and the whole of the internal arrangements are such that the group is in hydraulic balance. The packing arrangements are also exceedingly simple.

When running, the water gravitates, or is drawn into the eye of the revolving pressure drum where it is stationary relative to the drum. The water is carried round by the revolving partitions, and a pressure is created in the revolving drum by the centrifugal action of rotation. The capacity of the drum being large the water slowly moves toward the periphery where are located a number of short nozzles curved in a direction opposite to the direction of rotation. These nozzles convert a portion of the pressure into velocity and the water passing through them behaves as in a water turbine, assisting the rotation of the revolving drum and thereby giving self regulating effect. The escaped water still having velocity in the direction of rotation is passed between stationary diffusion channels which convert the remaining velocity into pressure.

The special feature of the pump is the construction of the impeller which instead of being built as a flat disc runner with the main object of securing velocity of water in the expanding channels of the fixed casing, is designed in the form of a barrel or pressure chamber, the object aimed at being to secure a constant pressure inside the revolving drum or impeller equivalent to the height of the lift. The impeller having this large capacity, the water inside as it approaches the rim becomes practically stationary relatively to the impeller, thus eliminating all friction losses and generating a pressure by centrifugal force which is the main feature of the patent.



STEAM TURBINE-DRIVEN LOW-LIFT CENTRIFUGAL PUMP.

The steam turbine in this set was also made by the Goldie & McCulloch Co., who supply this same type for both pumping and electrical units. In these smaller power units not more than two nozzles are needed, one being directly in series with the throttle governing valve, while the other one may be controlled by means of a hand valve. As in the other types the latter constitutes an auxiliary valve for use when the load increases over the capacity of the main nozzle which is usually designed to carry approximately full load. The governing mechanism and carbon stuffing rings are similar to those used on the larger power units and the same care is taken in the balancing and overspeed testing. These turbines are supplied either of vertical or horizontal split pattern.

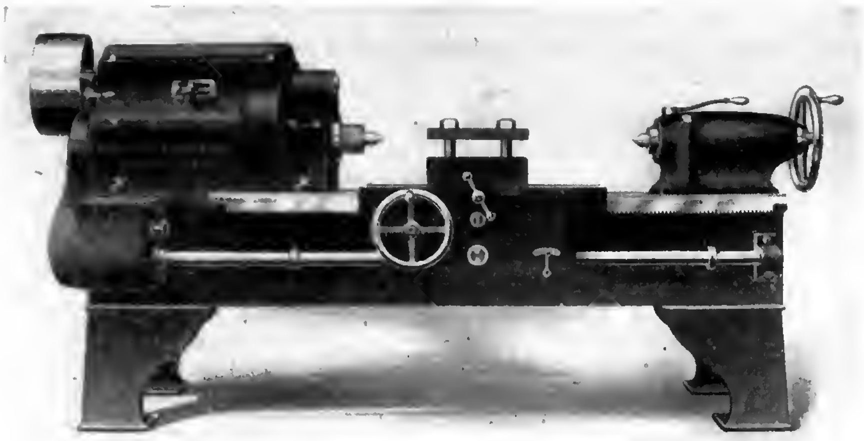
18 IN. GEARED HEAD MANUFACTURING LATHE

AN 18 in. manufacturing lathe possessing simplicity of design and convenience of arrangement which has been been placed on the market by Robert H. Snider & Co., Philadelphia, is shown in the accompanying illustration.

The headstock is of the single pulley gear-drive type; the minimum gear reduction being 2.75 to 1 and the maximum, 12 to 1. The driving pulley has an eight-inch width of belt, and is mounted on the end of the initial drive-shaft which carries the sliding gears. By means of a single hand lever, it is possible to put any of the sliding gears in mesh with its corresponding gear on the lower shaft, to which these gears are keyed fast. The lower shaft also carries a pinion which meshes with the large gear on the lathe spindle.

Only the gears at work are in mesh, it being impossible to engage more than one pair at a time. Power is transmitted from the pulley to the drive shaft through a friction clutch, the lever for

which is interlocked with the gear-shift lever, making it absolutely necessary that the clutch be released before gears can be shifted, and also that gears be properly in mesh before clutch can be re-engaged. The enclosed headstock allows the provision of an oil bath for lubricating the gears; oil wells with ring oilers being provided for the spindle bearings.



18 IN. GEARED HEAD MANUFACTURING LATHE

Four spindle speeds are obtained from the headstock gearing, these being doubled by the two-speed countershaft, giving a total of eight spindle speeds. The bed, carriage, and tailstock are of ample proportions to withstand the severest duty, and as at present offered for shell work the lathe is equipped with simple gear change, rod feed, and plain rest.

The principal dimensions are: Swing over bed, 18 in.; over carriage, 11¼ in.; between centres, 8 ft. bed, 38 in.; front spindle bearing, 5 x 7 in.; rear, 4½ x 10 in.; No. 5, Morse taper centres; tailstock spindle, 4 in. dia. x 9 in. travel; feeds, ⅛, 1-16, 1-32 in.; net weight, 4,100 pounds.

SHELL MARKING AND RIVETING MACHINES

THE illustrations Figs 1 and 2, show two machines for shell manufacture which have been developed by the Grant Mfg. & Machine Co., Bridgeport, Conn. The first of these is a shell marking machine which is so arranged that the blow is brought to bear on each individual letter and figure successively, while the blow can be adjusted to give a shallow or deep impression which is uniform for each letter or figure.

In operation, the marking chuck containing the characters is fastened on the end of the shell by means of a thumb screw. The shelf is then supported in an inverted position by a ball bearing revolving fixture, the base being now in position to receive the blow from the vibrating hammer. The work is completed in one revolution of the shell which is done by hand, the time required to mark a shell perfectly being 15 seconds. The machines are for 18 pdr., 4.5 in., and 60 pdr. high explosive shells.

FIG. 1 MACHINE FOR MARKING SHELL BASES

Fig. 2 illustrates a machine for riveting base plugs in shells of the high explosive type of 4.5 in., 5 in., or 6 in. size. A special supporting table, as shown is fitted with a support for the side of the shell, the nose resting in a suitable block which maintains the shell in the proper position under the hammer.

The riveting device is actuated by compressed air, and is fitted with a foot treadle which brings the hammer into action, leaving the operator with both hands free to handle the work.

The hammer strikes about 1,000 blows per minute which enables the plug to be riveted perfectly tight in one complete revolution, occupying about 20 seconds. The weight of this machine is 300 lbs.; free air per min. 18 cub. ft.; air pressure 80 to 100 lbs. per sq. in.

BRITISH exports of ferromanganese, spiegeleisen and ferrosilicon in 1915 are officially reported at 103,077 gross tons, but probably most of this was ferromanganese. In 1914 these exports were 111,788 tons and in 1913 they were 178,919 tons. Of the 103,000 tons exported in 1915, the United States received only 55,201 tons, showing that considerable quantities went to other countries.

In 1913 about 10,000 tons was imported from Germany by the United States.

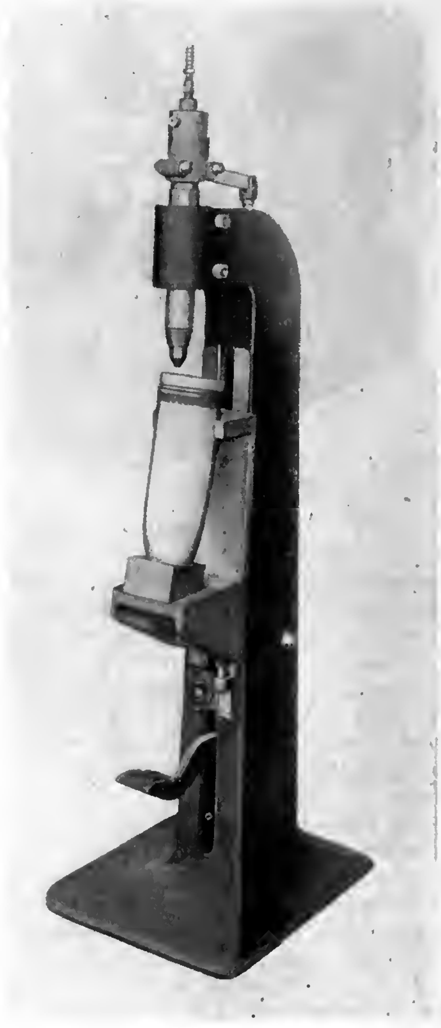


FIG. 2—PNEUMATIC RIVETER FOR SHELL BASE PLUGS

ZINC SMELTING

By F. E. Pierce.*

GENERALLY speaking, zinc sulphide ores will carry from 45 to 60 per cent. zinc and 30 per cent. sulphur, and one ton of average ore 50 per cent. will yield about 850 pounds of spelter and one ton of what is known as 60-degree sulphuric acid.

To-day is the golden age of the zinc business. Spelter sold recently for 17 cents pound. A ton of 50 per cent. ore costs about $100. The working costs are about $15 per ton of ore. About 850 pounds of spelter and a ton of acid are recovered. The spelter is worth about $135 and the acid about $40. The total receipts are, therefore, $175 and the costs $115, leaving profits of $60 per ton of ore. A 200-ton plant would return $12,000 per day, or pay for itself in less than eight months. In normal times, it would be lucky to pay for itself in 10 years.

Characteristics

Zinc has an atomic weight of 65.4; it is bluish white in color and has a crystalline fracture. It tarnishes on exposure, has a specific gravity of about seven, weighs about 435 pounds per cubic foot and has a tensile strength depending on its structure and purity of from 3,000 pounds and 10,000 per square inch. It is quite brittle when cold, but malleable and easily rolled between temperatures of 250 degrees and 300 degrees Fahr.; it is brittle again at 400 degrees Fahr., melts at 790 degrees Fahr., and boils at 980 degrees Fahr. Spelter is the commercial name for metallic zinc. Ordinary slabs of spelter weigh from 45 pounds to 70 pounds and measure 7 inches to 9 inches wide, 16 inches to 18 inches long and 1 to 1¾ inches thick.

Roasting

Zinc dust, of blue powder, is very finely divided metallic zinc superficially oxidized and is produced by the sudden cooling of zinc vapors. It is used where a strong reducing agent is required. In roasting zinc sulphide ore (ZNS) zinc oxide is produced and the loss in weight is approximately 15 per cent. In other words, 100 tons of green or raw ore will, when roasted, result in about 85 tons of roasted ore.

Every spelter man has his own pet formula for his retort and condenser mixes, but the proportions of grog and plastic clay are approximately half and half. To this is sometimes added graphite or coke dust in the proportion of 10 per cent. more or less. The spelter furnaces used in representative plants in this country include the Hegeler producer fired furnace; the natural gas furnace of the Hegeler type and the regenerative furnace of the Siemens or Neureuther type. Both the Hegeler and the natural gas furnaces have middle walls with ledges for supporting the butts of the muffles and front walls made of pillars and plates, held in place by buckstays. These furnaces have two arches, making really two furnaces in one block, back to back.

Classes of Ores

Zinc ores broadly are of two classes, oxidized and sulphides. The oxidized ores are easily reduced and play an important part in the smelting operation, but they are relatively of small tonnage and are used mainly for special purposes as a front charge, or for mixtures to obtain a more reducible or non-slagging charge. The sulphides are the basis of nearly all the spelter produced. They are obtained from the well known districts of Joplin, Missouri, Wisconsin, Montana, Utah, Colorado, Mexico, Australia—almost everywhere in fact. In addition to the zinc, they may contain 2 to 10 per cent. of lead, 2 to 15 per cent. of iron and varying percentages of silica, lime, etc., and they may carry in small percentages, silver, copper and gold. In almost all cases, the ores are concentrates from the run of mine of the district in which they occur.

Great attention has been given of late to the treatment of furnace residues, principally because of the silver values which they contain. A spelter furnace can be worked so that 60 to 70 per cent. of the silver in the ore will remain in the residues. This may amount to 10 ounces per ton of residue. About 50 per cent. of the lead in the ore will remain. This may amount to 50 to 100 pounds per ton of residues.

*From a paper read before the Engineers of Western Pennsylvania.

ALUMINUM AS EXPLOSIVE

THE USE of aluminum in aeroplanes is now widely known, but its use when filed to a powder is less understood. Yet in this condition it forms part of two of the most destructive agents used by the Central European Powers, says the London Standard.

The first is the high explosive used to charge the Austrian shells. This is known as "ammonal," a mixture of five or eight parts ammonium nitrate with one part of finely powdered aluminum. The exact proportions and the means for keeping the mixture dry are, of course, secrets which the Austrians keep to themselves, but even as made in English laboratories its explosive violence is tremendous.

It is one of the few explosives that has never been used as a propellant. No gun known to warfare could resist its suddenness. The explosion chambers would be smashed to pieces before the projectile had begun to move. So it is put inside the projectile itself, and allowed to explode amongst the enemy a few miles away from the gun. So far as we know it is only the Austrian howitzer shell that contains this horrible mixture.

MAGNESIUM IN FOUNDRY WORK

THE use of slightly less than 2 per cent. of magnesium in aluminum castings cleans up the aluminum and leaves 0.75 to 1½ per cent. in the casting, almost doubling its strength and quadrupling its resistance to shock or jar. It reduces the cost of machining more than 50 per cent., halving the number of resets on the cutting tool, giving clean cut machine surfaces, and permitting a polish to be secured with the last cut instead of a separate operation. With care, 1½ per cent. of magnesium at $5.50 per pound is all that is needed: i.e., 8¼ per pound of casting actually required to do the same work. The increase in strength means, in some cases, a reduction in weight of casting of 50 per cent.

The reduction in casting weight is generally not less than 25 per cent. The weight of a pure aluminum casting may therefore be reduced, if this 1½ per cent. of magnesium is used, by from 25 to 50 per cent. This is a great saving even at normal prices of aluminum, since it amounts to about one-fourth of 20c, or 5c. With aluminum at 60c per pound, it amounts to 15c worth of aluminum saved, with a stronger and more stable mechanical result. The saving in machine work alone, when the casting is to receive much machining, more than pays for the use of magnesium.—Dr. W. H. Grosvenor.

SO FAR as the effect of oils on concrete is concerned, the general conclusion, based on the results of tests and actual experience, seems to indicate that mineral oils (under which head may be classed lubricating oils and gasoline) show only a slight tendency to soak into the concrete and perhaps reduce its strength somewhat.

Several engineers have made investigations of concrete structures subject to the effect of engine oil and the like, and have found that in the few cases where there was any evidence of disintegration the concrete itself was of poor quality or the workmanship was inferior. If the concrete exposed to the mineral oils is porous, injured by frost while hardening, of a lean mixture, poorly mixed or improperly cured, there is no doubt that general penetration and weakening of the concrete will result. If, however, the concrete is made of well graded materials, properly proportioned, mixed and placed so as to obtain a dense, compact mass, the oils will have no destructive effect on the concrete.—Kinney.

The MacLean Publishing Company
LIMITED

(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.
H. C. FOGARTY.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. MARCH 30, 1916 No. 13

RUSSIAN LANGUAGE A FACTOR IN SECURING RUSSIAN TRADE

OF the many and varied trade opportunities being dangled before the Western eye meantime, those believed or known to exist in Russia have taken most tangible shape both in bulk and detail comparatively. The war has discovered Russia, in that through it her capacity to absorb raw and manufactured products of other countries has been more fully appreciated than ever before. She, of course, was not wholly neglected and allowed to shift for herself as best she could, although she could have done so by intensive development of her own known national and other resources. No, her alert neighbor Germany had, if not a strangle hold on her more immediate requirements, at least a two hand grip on these. In the years 1912 and 1913, the total imports into Russia amounted to $603,462,707 and $707,627,456 respectively, of which Germany's share was $274,158,035 and $335,887,510 respectively. In a word, Germany monopolized practically 50 per cent. of Russia's whole import business. A husky slice of this 50 per cent. constitutes the opportunity offering.

We are inclined to think that a somewhat hazy idea exists in most minds as to what is implied when we speak of Russia and the capture of her important trade. We fail in large measure to appreciate the extent of the territory involved or the contained population. It is not too generally known that the country is rich in minerals and agricultural products, that were her civilization as advanced, at least so far as the great bulk of her population is concerned, as is that of Western nations, she has everything to constitute an entirely self-contained condition. Russia's mineral wealth compares quite favorably with the richest of nations in that respect, gold, silver, copper, platinum, manganese, iron, coal, timber, etc., being available. Enterprise in development of resources and cultivation of manufacturing skill has been, however, limited in scope and application, hence our export opportunities.

It is becoming daily very evident that to Russia more than to any other nation or state, initiation and extension of trade relationships are directed, and not the least outstanding feature of the situation is that pertaining to the part which familiarity with the Russian language and the business habits of the Russian people will play in achieving worth while and permanent results. Regarding knowledge or use of the Russian language, it may be at once affirmed that this is absolutely indispensable on the part of those who would seek to negotiate business by representative or otherwise. Canada at the moment is much interested in establishing an export connection with Russia, and in the matter of the language some few facts may therefore not come amiss here.

Russian, we are in a position to state is in no sense a language hard of acquirement, and has this attractive feature when pressed into service that it is the common language throughout the length and breadth of the country. At the moment, many Britishers are studying it, and with a view to backing up still further their efforts in that direction, a Russian Directory of British Manufacturers has recently been published; the latter constituting thereby a real practical and forward step towards stimulating British trade with Russia already established, and a powerful weapon whereby Germany's enormous exports to Russia can be diverted to British manufacturers.

This Directory contains nearly 400 pages, carries trade headings in both the Russian and English languages, and includes a brief supplement entitled "Sidelights on Russia," as well as numerous advertising pages. The volume otherwise is printed in Russian, is edited by R. A. Lenski, and is indicative of the support of at least the leading representative British manufacturers.

The demand for catalogues and specifications in the Russian language has never been so keen as at the present time says a British contemporary. Russian buyers are at a loss to find out whence to obtain prompt and reliable information as to where special requirements may be bought. The British Vice-Consul at Ekaterinburg reports that in the Ural mining works a great dearth of machinery in general is now beginning to be felt and to a serious extent, and fears exist as to whether Allied and Neutral Powers will be able to take the place of Germany as far as the tremendous quantity of machinery formerly supplied by her to Russia is concerned.

The British Board of Trade Journal advises that immediate and complete preparations should be made by all firms anxious to share in Russian business following the war. Here again, a good knowledge of the Russian language as well as a technical and practical knowledge of machinery is insisted on. The situation, moreover, in this particular territory is apparently so desperate now that representatives equipped as above are requested to be sent at once. The Russians, it is added, will be only too glad to offer every assistance. Owing to the meantime difficulty of obtaining spare and renewal parts for the German equipment installed, it is expected that the conclusion of the war will see existing plants worn out, necessitating entire renewal.

No attempt has been made in the foregoing to go beyond the language feature as bearing on the initiation of an export trade with Russia, data relative to business methods to be employed, being probably found as complete and instructive in this direction in the Preliminary Report on Russian Trade issued by the Department of Trade and Commerce, Ottawa. Canadian manufacturers, accustomed as they are to maintaining a staff of qualified salesmen for the distribution of their product in English-speaking territory, and who place a more or less potential value on their advertising mediums, whether trade and technical journal or catalogue, will not fail to realize that language appropriation in their trade expansion campaign in Russia constitutes next to quality of product their most powerful weapon of success.

INDUSTRIAL NOTABILITIES

ROSS HUNTINGTON McMASTER, director and manager, Steel Company of Canada, Hamilton, Montreal, etc., was born at Montreal, Oct. 11, 1880, the son of William and Lucy (Greene) McMaster.

He was educated at Montreal High School and Collegiate Institute, and began his business career as office boy with The Sherwin-Williams Co., Montreal and Cleveland, later becoming assistant to the vice-president and general manager, 1897-1903. He became assistant to the vice-president and general man-

ROSS HUNTINGTON McMASTER

ager, Montreal Rolling Mills Co., 1903, occupying that position until formation of the Steel Company of Canada, when he became Manager of the Montreal plant.

Mr. McMaster married Ruth M. Laing, daughter of Peter Laing, Montreal, June 24, 1908; the family consisting of one son and one daughter.

His clubs are St. James' and Forest and Stream, Montreal; Beaconsfield Golf; M.A.A.A., and Indoor Tennis, Montreal, while his recreations are tennis, golf, riding. He is a lieutenant in the 3rd Victoria Rifles.

Mr. McMaster is Conservative in politics and Presbyterian in religion. He resides at 43 McGregor St., Montreal, Que.

—Photo, Courtesy International Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	
	Montreal.	**Toronto.**
Middlesboro, No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	3.00
Steel bars, 2 in. and larger, base	4.00
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	3.00
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	3.00
Small shapes	3.25
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	3.10
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$31 00	$30 50
Electrolytic copper	31 00	30 50
Castings, copper	30 00	30 00
Tin	50 00	54 00
Spelter	23 00	22 00
Lead	10 00	10 50
Antimony	48 00	48 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, ¼ to ½ in.	$3 75	$3 75
Heads	4 00	4 00
Tank plates, 3-16 in.	4 05	4 10

WROUGHT IRON PIPE

Prices in effect March 20, 1916

Buttweld

Per 100 feet	Black	Galv.
⅛ in.	$ 3 00	$ 4 25
¼ and ⅜ in.	2 88	4 95
½ in.	3 66	5 65
¾ in.	4 37	7 07
1 in.	6 46	10 46
1¼ in.	8 74	14 15
1½ in	10 45	16 91
2 in.	14 06	22 76
2½ in.	22 23	35 98
3 in.	29 07	47 05
3½ in.	34 96	56 58
4 in.	41 42	67 04

Lapweld

	Black	Galv.
2 in.	15 54	24 24
2½ in.	22 82	36 56
3 in.	29 84	47 81
3½ in.	35 88	57 50
4 in.	42 51	68 13
4½ in.	52 07	83 19
5 in.	60 68	96 94
6 in.	78 72	125 80
7 in.	109 50	167 80
8 in. x 25 lbs. per ft.	115 00	176 30
8 in. x 28 lbs. per ft.	132 50	203 00
9 in.	158 70	243 20
10 in. x 32 lbs. per ft.	147 20	225 60
10 in. x 40 lbs. per ft.	189 50	290 50

Ontario list—All points from Kingston and west to, but not including Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
⅛ in.	$ 3 00	$ 4 48
¼ in. and ⅜ in.	2 82	4 89
½ in.	3 57	5 57
¾ in.	4 26	6 96
1 in.	6 29	10 29
1¼ in.	8 51	13 92
1½ in.	10 18	16 64
2 in.	13 69	22 39
2½ in.	21 65	35 39
3 in.	28 31	46 28
3½ in.	34 04	55 66
4 in.	40 33	65 95

Lapweld

	Black	Galv.
2 in.	15 17	23 87
2½ in.	22 23	35 98
3 in.	29 07	47 05
3½ in.	34 96	56 58
4 in.	41 42	67 04
4½ in.	50 80	81 92
5 in.	59 20	95 46
6 in.	76 80	123 80
7 in.	107 10	165 49
8 in. x 25 lbs. per ft.	112 50	173 80
8 in. x 28 lbs. per ft.	129 60	200 20
9 in.	155 30	239 80
10 in. x 32 lbs. per ft.	144 00	222 40
10 in. x 40 lbs. per ft.	185 40	243 30

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 00	$17 75
Copper, crucible	21 00	21 00
Copper, unch-bled, heavy	20 75	20 75
Copper wire, unch-bled	20 75	20 75
No. 1 machine compos'n.	16 50	16 25
No. 1 compos'n turnings.	14 75	14 00
New brass clippings	15 50	14 00
No. 1 brass turnings	11 25	11 25
Heavy melting steel	9 00	9 30
Boiler plate	11 75	14 00
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	10 50	9 00
Stove plate	9 50	8 50
No. 1 machin'y cast iron	14 75	13 00
No. 1 machin'y cast iron	14 75	14 00
Heavy lead	7 25	7 25
Tea lead	6 25	6 25
Scrap zinc	15 75	15 75
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	60
Stove bolts	72½
Plate washers	30
Machine bolts, ⅜ and less	52½
Machine bolts, 7-16 and over	42½
Blank bolts	42½
Bolt ends	42½
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12½
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hexagon, all sizes	2¾c per lb. off
Nuts, hexagon, all sizes	3c per lb. off
Copper rivets and burrs, list plus	15
Burrs only, list plus	30
Iron rivets	42½
Boiler rivets, base, ¾-in. and larger	$4.35
Structural rivets, as above	4.10
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47½
Wood screws, flathead, bronze	40

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh.	45 00
Forging billets, Pittsburgh	66 00
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 45	$3 40
Cut nails	3 15	3 20
Miscellaneous wire nails..	75 per cent.	
Pressed spikes, 5/8 diam., 100 lbs.	$3 75	

MISCELLANEOUS

Solder, guaranteed	0.31½
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb...	.53
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.79
Linseed oil, raw, single bbls.	.98
Linseed oil, boiled, single bbls.	1.01
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs...	6.00
Lead wool, per lb.	0.13
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	55
Standard drills over 1½ in.	30
3-fluted drills to 1½ in.	30
3-fluted drills over 1½ in.	20
Bit stock	65
Ratchet drills	30
Machine bits for wood	30 and 5
S.S. drills for wood	55
Wood boring brace drills	40
Electricians	35
Sockets	55
Sleeves	55
Taper pin and taper reamers	25
"Premier" and "Leader" chucks..	10
Arbors for above	10
Drills and countersinks	5
Bridge reamers	55
Centre reamers	15
Chucking reamers	15
Hand reamers	15 and 5

High speed drills and reamers are double the list price plus 20 per cent.

COLD ROLLED SHAFTING

At mill	Net
At warehouse	List Plus 10%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 5 per cent.; B and C, 25 per cent.; cast iron, 50 and 10; standard bushings, 60 per cent; headers, 60; flanged unions, 60; malleable bushings, 65; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$3 90
Sheets, black, No. 10...	4 35	4 35
Canada plates, dull, 52 sheets	4 00	4 00
Canada Plates, all bright	6 30	5 50
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G...	7 25	7 25
Gorbal's Best, No. 28....	7 50	7 50
Colborne Crown, No. 28 ..	6 75	6 75
Premier, No. 28, U.S. ..	6 75	6 90
Premier, 10¾ oz.	7 50	6 95

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.35
⅜ in.	6.90
7-16 in.	6.75
½ in.	6 55
9-16 in.	6.55
⅝ in.	6.35
¾ in.	6.15
⅞ in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B B

⅛ in.	$14.00
3-16 in.	10.45
¼ in.	7.15
5-16 in.	5.65
⅜ in.	4.60
7-16 in.	4.60
½ in.	4.60
⅝ in.	4.45
¾ in.	4.45

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	70
Kearney & Foot, Arcade	70
J. Barton Smith, Eagle	70
McClelland, Globe	70
Black Diamond	65
Delta Files	70
Nicholson	70
Globe	70
Vulcan	70-10
Disston	70

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	.....
1¼ in.	19 55	.....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	12 10
2¼ in.	26 60	13 30
2½ in.	29 00	15 95
3 in.	38 70	16 06
3½ in.	44 00	22 00
4 in.	49 50	27 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.23
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	.04¾
Lard oil, per gal.	1.28
Thread cutting oil	.54
Imperial quenching oil	.38
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble,	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal...	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.15¼
Peerless	.15¼
Grand	.14¼
Superior	.14¼
X L C R	.13¼
Atlas	.13¼
X Empire	.12¼
Ideal	.12¼
X press	.11¼
COLORED.	
Lion	.09½
Standard	.08¾
No. 1	.08¾
Popular	.07¾
Keen	.06¾
WOOL PACKING.	
Arrow	.20
Axle	.15
Anvil	.11
Anchor	.09
WASHED WIPERS.	
Select White	.09
Mixed Colored	.07
Dark Colored	.06

This list subject to trade discount for quantity.

COPPER SHEETS

	Montreal	Toronto
Bars, ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 m..	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base ...	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.34 to .36
Tin	.50 to .54
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs, American..	.03 to .04
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass...	.15 to .25

Prices Per Lb.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy	.35
Copper sulphate	.25
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)..	.20
Silver chloride ....(per oz.)	.65
Silver nitrate ....(per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., March 27, 1916.—While the present industrial activity is largely due to war conditions, there are increasing indications that the domestic life of Canada is gradually improving. The prosperity of the past eighteen months has indirectly opened up new fields of industry, which will during the coming year be considerably developed. Many lines of manufactured articles, heretofore produced in foreign countries, are now being made here, and many others are under consideration.

The shipment of material, both by land and water, has been greatly restricted owing to embargoes and lack of ocean vessels. This, however, is expected to receive some relief in the near future.

Pig Iron

Reported additions to steel plants and foundries, both here and in the States, will likely have some effect on future conditions of the pig iron market. In view of the fact that smelting facilities are now taxed to capacity, any additional pressure for steel-making iron will result in an advance on the present price of pig iron. It is generally believed that prices will shortly advance, and the market generally is much stronger than a week ago. Bessemer pig, Pittsburg, has advanced 50 cents a ton, and several grades of American iron show similar increase. Local conditions, however, are comparatively unchanged, and prices are holding firm.

Steel

Advices from the Pittsburg district report that the continued advances on all steel and steel products is creating considerable anxiety among some consumers, and many are showing a tendency to hold off from placing contracts for far future delivery, preferring to take chances on future conditions.

Steel prices, especially in the Pittsburg district, continue to advance. Bessemer billets and steel bars have advanced $5 a ton, being quoted at $45. Wire rods also show an increase from $55 to $60 a ton. Steel hoops are higher by ¼c, being quoted at 2¾c. Plate mills are working at capacity in an effort to supply the demand, and prices on plates are ever upward. A further advance is noted in Pittsburg quotations; a price of 2.60c is given for mill convenience delivery; three month 3.50c, and small earlier lots are as high as 4c. The demand for structural shapes is on the increase, with the resulting effect of higher prices asked. An advance of $3 Pittsburg is noted. Sheet mills are practically unable to supply the heavy demand, being in many instances booked for the remainder of the year. Blue annealed sheets are especially active, and quotations are higher; Pittsburg 3c. mill convenience and Philadelphia prices run as high as 4.15c; all prices, however, are nominal. Cold-rolled steel strip stock shows an advance of 50c a hundred, present quotation being 6c a pound.

Following the advances noted in last week's market quotation, Montreal steel prices are holding firm, with the exception of billets, which have been increased this week. The advance this week shows an additional $3 on Bessemer and open-hearth billets, and $2 on forging billets, the respective quotations being $48 on Bessemer and open-hearth, and $68 on forging billets. Montreal dealers are quoting $58 on wire rods, being an advance of $3 a ton. War business continues to predominate, but domestic possibilities are showing improvement.

Metals

The general situation in metals is unchanged, and a tone of quiet prevails. The copper market is easier, following a short spell of activity earlier in the week. Tin is unsteady, and interesting developments may be expected shortly. Spelter is dull again after a few days of brisk business. The attitude of the Trust is one of the influencing features of the lead situation. This stand of the leading interest may have an important bearing on future conditions in the lead market. An apparent scarcity of antimony seems to be developing. Aluminum is slightly stronger, but prices are firm.

Copper.—The copper situation, while apparently unchanged, shows an undertone of unsettled conditions. While the production seems to maintain a fair relation to the demand, the foreign supply is gradually decreasing. This is somewhat pronounced by the fact that the London price has again advanced £6 on spot and £4 on futures. This is in addition to last week's advance of £3 10s. and £3 respectively. In direct contrast to

reported peace negotiations, producers are being continually flooded with requests for bids and specifications on war supplies and munitions.

The visible supply in the United States is somewhat in excess of the demand, and the market is showing signs of dullness, with a tendency to weakness. Some difficulty is being experienced owing to railway freight embargoes, and delivery is very irregular. Some dealers are reported to have shipped considerable copper by express in order to accommodate customers. However, the general feeling appears to be a somewhat easier market, and Friday's quotation on New York market shows a falling off of ¼c per pound, lake and electrolytic being quoted at 27½c and castings at 26c a pound nominal. Local dealers report a steady market, with prices firm at 31c for lake and electrolytic. and 30c a pound for castings.

Tin.—The situation in tin continues to take on strength, and there is considerable speculation as to the reason of recent advance quoted in London. The contention that this is caused by the British regulations regarding foreign shipments does not coincide, as this condition should, if anything, make the market easier in London than elsewhere; whereas the advance in tin amounts to £4 10s. on spot, £3 on future standard, and £4 on spot tin from the Straits. The scarcity of nearby tin is disclosed by the fact that efforts have been made to purchase tin afloat for America. However, as the greater portion of tin now in the holds of vessels is under contract, the advance, reported in London, may be traced to this fact. Far-off deliveries can be contracted for about 43¼c, but prices for intermediate positions vary up to the nominal figure of 50c early delivery. Local dealers who reported an advance of 2c last week have declined a similar amount, and they are again quoting 50c a pound.

Spelter.—Following a recent advance on the London market, a decline of £1 is noted during the past few days. However, the week's quotations show an advance of £3 on futures. Slight improvement is noted in the week's activities, and general conditions indicate a stronger market, but American prices have temporarily declined ¼c per pound. Local conditions are unchanged, and prices are firm at 23c per pound.

Lead—The situation in lead is comparatively quiet at present. London quotations for spot and futures are drawing closer together, spot having advanced 5s and futures declined 2s. The conditions here are for a stronger market, and quotations show an advance of ¼c a pound, this week's price being 10c per pound.

Antimony.—Very little change is noted in antimony, but there is an evident scarcity of metal, which is having the effect of maintaining a strong market. Prices are firm and unchanged at 48c.

Aluminum.—Aluminum is firm and unchanged at 68c a pound.

Machine Tools and Supplies

The general situation in the machine tool industry remains unchanged, but increased activity is looked for in view of the fact that orders have recently been placed for additional shells of the smaller sizes, with others pending. There are also prospects of increased business in the larger shells, which will necessitate the placing of orders for additional equipment. In the case of the smaller shells, the orders, in all likelihood, will go to those firms who are at present manufacturing these shells, and there is not, therefore, so much possibility of further new equipment from these sources.

The demand for machine accessories and supplies, in connection with the production of munitions. continues to keep the small tool makers exceptionally busy.

> **CANADIAN GOVERNMENT PURCHASING COMMISSION**
>
> **The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.**

Old Materials

The demand for heavy melting steel scrap is comparatively heavy, and dealers are paying relatively high prices, which continues to keep the steel scrap market in a fairly strong condition. The Pittsburg district shows a little advance of 25c a ton, while New York is quoting $5 a tin lower than last week. Dealings in copper scrap are not so active, but the market is generally strong; light copper quotation has advanced ¼c per pound. Machine compositions and turnings are in good demand, and the market is becoming stronger on advancing prices. No. 1 machne is quoted at $16.50 and composition turnings at $14.75, being an advance in each case of ¼c per pound. The evident scarcity of wrought iron scrap is having the effect of advancing prices; wrought iron axles this week showing an advance of ¾c, and quoted at 18c per pound.

The prevailing strength of the pig lead is having a similar effect on the scrap lead situation, and dealers report further advances in heavy and tea lead. the former quoted $7.25 and the latter at $6.25 per hundred, being an advance over last week of ¼c per pound.

Scrap zinc is firm, with prices higher, being quoted at 15¾c, and old aluminum has advanced 1c, present price being 35c a pound.

Toronto, Ont., March 28—There is no material change in the industrial situation, but further improvement in business is anticipated with the approach of more open weather. The outlook is favorable and the manufacturers are looking forward to a year of continued activity. The scarcity and high prices of raw materials is becoming an important factor to be considered and many manufacturers are being handicapped on this account. The cost of practically all finished products is steadily advancing and a scarcity in many lines is anticipated. This is particularly true of steel products and indications point to higher levels before the top of the market is reached. The principal advances made this week include steel bars, wrought iron and galvanized pipe, boiler plates, shafting, iron rivets, plate washers, bright and brass wood screws and nuts, pipe fittings, files, soldering coppers, lead wool. In the ingot metal market, tin is weaker, otherwise prices are unchanged.

Steel Market

The steel market is very firm and prices continue to advance. The mills have practically sold their entire output for the year and are thus in a very strong position. Reports from the steel companies are very optimistic and all indications point to continued activity for the rest of the year. There appears at the present time to be little possibility of any serious weakness developing in the market during the year, but if the market in the United States should decline materially, and some authorities believe that it possibly will do so, then the Canadian market might be affected. There is a feeling that prices are too high and the market for this reason is top heavy. There is, however, no indication that the market has reached the top, but there are signs that prices will probably not go very much higher.

A number of price changes have been made during the week, all in an upward direction. Boiler plates have again advanced, being 25c per 100 pounds higher than last week's quotations. Boiler plates ¼ to ½ in. are now quoted $3.75, heads $4, and tank plates 3-16 in. at $4.10 per 100 pounds. Wrought iron pipe is higher, being the second advance this month. Black pipe has advanced two points and galvanized pipe three points. Cold rolled shafting has advanced and is now quoted at list, plus 10 per cent. f.o.b. warehouse. Steel bars have also advanced and are now

quoted at $3, but iron bars are unchanged at $2.75 per 100 pounds. Toronto warehouse prices on steel bars and shapes are higher, bars being quoted at $3 and shapes at $3.25 per 100 pounds. Prices of boiler tubes are very strong and an advance is looked for in the near future.

The high-speed steel situation is more or less unchanged. Reports from Sheffield, England, state that it is almost impossible to turn out sufficient high-speed steel for munition tools, and that export licenses, more especially to neutral countries are being closely restricted. On account of this heavy demand, comparatively little high-speed tool steel is coming to Canada from England. There is also a big demand in the States for high-speed steel which is tending to keep the prices up and the supplies scarce.

The sheet market is strong with an upward tendency. Sheet bars continue to advance in price, the present level being rather unattractive to sheet mills. There is a big demand for heavy gauges, but the market for lighter gauges is slow. The galvanized sheet market is firm, but unchanged. The uncertain fluctuations in spelter and continued high prices has rendered this market unattractive to most makers.

The steel market in the States is very strong and prices still have an upward tendency. There appears, however, to be an opinion held in some quarters that prices can hardly go much higher and that the top of the market has nearly been reached. The new demand is reported as being very insistent and the pressure on mills for deliveries as strong as ever. Prices of billets are firm and unchanged, but wire rods have advanced to $60 per ton Pittsburgh.

Pig Iron

The pig iron market is firm and the situation unchanged. There is some improvement in the demand for foundry grades of pig iron. Hamilton and Victoria brands are unchanged at $24 per ton.

Old Materials

The market is steady with prices at approximately the same level as last week. Copper and lead are strong and in good demand. Prices on copper are firm and unchanged, but lead has advanced ½c a pound. Heavy melting steel continues in good demand, but quotations are unchanged.

Machine Tools

Business is comparatively quiet, but would be considerably better if machine tools could be obtained when required. Deliveries are so backward on standard tools that dealers are being seriously handicapped in doing business. The demand is still largely for tools for munition plants. Prices on machine tools continue to move toward higher levels. Some makers have made a further advance of 10 per cent. on grinders and engine lathes, whose figures are now approximately 40 per cent. higher than a year ago.

Supplies

Prices of many lines of machine shop supplies continue on the up-grade, a number of changes having been made during the week. Prices of all lines of milled products, such as cap and set screws, nuts, etc., are higher. New and lower discounts have been issued on pipe fittings. The new discount on plate washers is 30 per cent., iron rivets 42½ per cent., bright wood screws 47½ per cent. Soldering coppers have been advanced to 53c per pound base. White lead is now quoted at $13.95 per 100 pounds in ton lots, while red lead is quoted at $13.87 per 100 pounds. Lead wool is 1c higher and is quoted at 13c per pound. The linseed oil market is weaker and prices have declined to 98c for raw and $1.01 for boiled oil, per gallon. Gasoline and benzine are unchanged, but higher prices are certain in the near future. Files are a shade higher, the new and general discount being 70 per cent. A change in discounts on carbon drills is looked for shortly.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian.—Col. N. Golejewski, Military Attaché, Room 904 Flat Iron Building, New York City.

Metal Market

The situation in the metal market is unchanged and prices with the exception of tin are the same as last week. The lead situation is the most interesting feature and the market is strong. The "Trust" price is still below outside quotations, but the reason for this is not very clear. The tin market in New York is easier, due to large arrivals of metal, while copper is dull and unchanged. Spelter is weaker, following a decline in London, but quotations are unchanged. The antimony situation is unchanged and quotations are nominal. There is nothing of particular interest to note regarding aluminum and the market is stationary. Prices of solder are unchanged, but firm.

Copper—The market is firm and dull, with quotations nominal. The position of copper continues to be strong as indications point to a heavy consumption for many months. The present dullness, however, may be accounted for by the fact that there is now enough copper for sale to take care of any demand that is likely to develop for the next two months at least. Local quotations are nominal and unchanged at 30½c per pound.

Tin—Although the market is easier in New York, due to large arrivals of tin recently, a recovery may be looked for in the near future. The London market is strong, due to increased demand and supplies of spot metal are getting lower. The consumption of tin has increased considerably and will likely continue to do so for months to come. Tin has declined 1c and quotations are nominal at 55c per pound.

Spelter—The market is quiet and steady following the recent activity. The demand for spelter is light, consumers in the meantime staying out of the market awaiting developments. Local quotations are unchanged at 22c per pound.

Lead—The situation is unchanged, but at the same time it is unprecedented. It is difficult to determine the actual level of prices, as the "Trust" price is nominal and it is not selling at that figure, but will sell in April at the average of its own quotations for that month. The demand for lead is heavy and the market has an upward tendency. Local quotations are unchanged at 10½c per pound.

Antimony—The antimony situation remains unchanged. The scarcity of spot metal is acute and the market very firm. Quotations are nominal at 48c per pound.

Aluminum—The market is quiet and quotations nominal at 68c per pound.

Solders—Prices are firm and an advance may be looked for as both tin and lead are likely to go higher. Guaranteed is quoted at 31½c and strictly at 29c per pound.

Winnipeg, Man., March 25.—Local shops which had orders for shells, appear to have had their contracts renewed. Labor conditions are becoming somewhat acute in Western Canada, it being not an uncommon thing to find several engineering firms advertising in city papers for machinists. The shortage is due to a large number of work-

men having enlisted during the past two or three months. Wages being paid are comparatively high. Speaking generally, the machinery business is fairly active, although in some lines there is considerable difficulty in getting deliveries. A large number of enquiries are coming in for lathes, but in most cases dealers are unable to meet them.

Following the phenomenal advances which have taken place in the prices of steel and iron, there is meantime somewhat of a lull. The opinion is expressed, that it will not be very long before prices move on the up grade again. Jobbers who handle threshers' supplies have been buying heavily.

DEVELOPING OUR EXPORT TRADE

THE Federal Government with an eye to the extension of trade in all countries where Germany was intrenched before the war, has made arrangements to send experts not only to several of the South American countries, but to Europe as well. Andrew J. Dawes, director of the Merchants Bank of Canada, Montreal, while discussing this energetic move on the part of the Ottawa Government, said that already a number of men had been selected by the Department of Trade and Commerce as capable of working up Canadian trade with foreign countries, and he particularly mentioned Russia, Chile, Argentine, and perhaps Brazil.

Mr. Dawes said he knew the man who would go to Russia, and that he was proficient in the Russian tongue and would be quite at home in any part of the Czar's dominions. The old Russia had passed away, and, after the war, that country would open its doors to Britishers and Canadians quite as freely as to any others, consequently Mr. Dawes expects that the efforts of the Canadian Government will be amply rewarded for the steps now being taken to get the trade that once belonged to the common enemy.

He also designated the proposition to send expert trade commissioners to South America as a step in the right direction, adding that, while the man going to Brazil would have to speak Portuguese, the commissioners to the Argentine and Chilian republics would have to be familiar with Spanish.

Germany's success in South America was not because their goods were better than the products from other countries, but because the Teuton manufacturers endeavored in every way possible to meet the wishes of their customers, both in the quality of the goods sold and in the size of the packages, which, Mr. Dawes declared, meant much to South American buyers.

GERMAN PERIL AFTER WAR

"GREAT BRITAIN and her Allies will face a new peril after the present conflict in an industrial war for which Germany has long been preparing by the creation of a new and formidable class of highly skilled workmen." This statement was made by Viscount Haldane, the former Secretary of State for War, in an address at the University of London.

"I want to sound a warning of what is in store for us," he continued. "I am more afraid of an engine for conquest in peace time, which the Germans were busy preparing before the war, than I am of the 42-centimetre guns. This engine is educational. The most modern form of continuation school is extending itself over a large part of Germany, and it is planned to extend it over the whole empire. It is a work school for imparting trade skill and general knowledge, rather than a mere book school, and it behoves us to be prepared for the shock of this competition which is coming after the war. Germany is training the youth of the land in special skilled trades, to outdistance competitors throughout the world."

BRITAIN INCREASES PROHIBITED GOODS

A LENGTHY extension of the list of articles, the importation of which is prohibited, which was farcast by Walter Runciman, President of the Board of Trade, was announced in London, on March 24 by the Board of Trade. The Board gave notice that a proclamation would be issued shortly prohibiting, after March 30, the importation of the following goods:

Baskets and basket ware, except of bamboo; cement, chinaware and pottery, not including cloisonne wares; cotton yarn, cotton piece goods and cotton manufactures of all kinds, except hosiery and lace; cutlery; fatty acids; furniture, manufactured joinery and other wood manufactures, except lacquered ware, hard ware and hollow ware; oilcloth, soap, toys, games and playing cards, wood and timber of beech, birch, elm and oak; woolen and worsted manufactures of all kinds except yarns.

The importation of these prohibited goods will be allowed only under a licence, but the Board of Trade states such licenses will generally be granted only for goods on the way to the United Kingdom or goods actually purchased when the notice is issued.

WAR OFFICE GIVES CANADA PREFERENCE

THE recent criticisms in the Canadian Parliament of the High Commissioner's office in London have caused considerable surprise amongst the Canadian community in London. As regards war orders all representatives of Canadian industries agree that Sir George Perley and his secretary, Mr. Griffith, have done their utmost. Harrison Watson, the Trade Commissioner, has frequently emphasized the fact that the limitations of orders was on account of Canadian unpreparedness for the rush of work. The British Government departments have given the preference to Canadian over American firms. On matters touching expert knowledge there are numerous Canadian railways, banking and financial corporations which are at the disposal of the High Commissioner's office if required. The office staff, which was charged with lacking Canadians, has the advantage of including several who have been attached there for many years, are thoroughly familiar with Canadian affairs.

EXPORT OF NICKEL FROM CANADA

THE Government has passed an order-in-Council prohibiting the export of nickel to any but British countries. The order applies to nickel, nickel ore and nickel matte. Since the outbreak of war, nickel has been exported from Canada to the United States under license. The Order-in-Council has been passed, upon the recommendation of the Minister of Customs, Hon. Dr. J. D. Reid, following a lengthy investigation of the question of nickel exportation.

On the outbreak of war, the desirability and importance of preventing Germany and her Allies from securing nickel originating in Canada was given consideration by the Government and steps were taken to prevent Canadian nickel from finding its way to enemy destinations. An arrangement was made with the International Nickel Co., of New Jersey, which controls the bulk of the Ontario nickel production, whereby the exports of refined nickel from the company's plant in the United States were checked by an official of the Canadian Government. This arrangement was made with the knowledge and approval of the Imperial Government. Since then the statement has been made in Parliament by the Solicitor-General, Hon. Arthur Meighen, that not a pound of Canadian nickel has gone to Germany since the war began.

Will Establish Plant

Some months ago the Government entered into correspondence with the International Nickel Co., with a view to having a plant erected in Canada for the treatment of Canadian nickel ores, and the company agreed to establish a refinery sufficient to take care of all the

Empire's needs in regard to nickel. It was intimated that this plant would be established somewhere in Nova Scotia. Whether or not any further steps have been taken by the company toward the establishment of this plant is not stated, but under the prohibitory order, now passed, this arrangement for the treatment of Canadian nickel ore in Canada will have to be carried out if other facilities for the manufacture of nickel within the Empire are not provided.

The nickel deposits of the Sudbury district of Ontario furnish about eighty-five per cent. of the world's nickel supply. Nickel is recovered also from the silver-cobalt ores of the Cobalt district. The largest producer of nickel outside of Canada is the French colony of New Caledonia. The Order-in-Council which has been passed by the Government prohibits the export of a number of other products besides nickel, except to British countries. The list includes asbestos, which is used largely in furnace construction; sugar, refined and refined; candy, wood ashes, pepper. The prohibition is "to destinations other than the United Kingdom or British Possessions.'

WAR LOSSES IN METALS.

THE losses of all the metals have been multiplied many times by the great war, says the Engineering Magazine. The British high explosive or shrapnel shell goes to the field with a brass head which is unscrewed, thrown away, and the time or percussion fuse screwed in. This fuse is also usually of brass, and the shell has a copper ring to take the grooves of the rifling. The shell is fired, and the copper and brass are lost. If the shell is shrapnel, the lead-antimony bullets are lost also. The French shoot a rifle bullet which is pure copper, the other nations, one containing considerable lead and usually antimony, sometimes with a nickel-steel or supronickel jacket. Every detonating cap used results in the volatization of a little mercury. Early in the war it was estimated that 112,000 metric tons of copper were being consumed yearly by each side, much of which is unrecoverable. The figure is probably low. The trench-furrowed fields of Europe will probably make rich picking for a while for the old-metal man, but most of this spent wealth will almost inevitably be lost.

STEEL CO. OF CANADA MEETING

THE directors of the Steel Company of Canada, at a meeting held at Toronto last week, wiped the slate clean of dividend arrears on the cumulative preferred stock by declaring a 3½ per cent. dividend on back dividend account, in addition to the regular 1¾ per cent. dividend for the quarter. When the two dividends, totalling 5¼ per cent. and calling for a disbursement of $341,555, are paid on May 1 next, full amends will have been made to shareholders for the temporary loss sustained through the deferring of payments from the fall of 1914 to the fall of 1915.

Considering that the company resumed regular quarterly payment only six months ago, the arrears have been paid off in exceptionally short order. After a lapse of a year, with 7 per cent. owing to shareholders, the company put the stock back on a dividend basis last September with a 1¾ per cent. declaration for the third quarter of 1915. In December, with the final quarterly delaration for the year, it was decided to pay 3½ per cent. on back account, or a dividend of 5¼ per cent. in all. That was paid on February 1st. With a like dividend to be disbursed on May 1, shareholders will have received a total of 10½ per cent. in amount three months.

Company in Strong Position

The rapid paying off of the accumulated dividends furnishes convincing proof of the strong cash position which the company has built up in the past year or so as well as of general prosperity in the steel industry. The February and May disbursements call for the large sum of $682,110 and it may be presumed at once that the directors would not have committed themselves to such a quick clearing of the slate if it were likely to jeopardize the working capital position. For instance, it would have been far from unsatisfactory to shareholders had the board decided to back one back dividend with each quarterly dividend through the current year. The ability and willingness of the company to discharge its obligations to shareholders without further delay is inferentially impressive of a position of unusual strength.

Domestic Business Developing

Following the meeting, C. S. Wilcox, the president, issued a brief statement to the effect that the most encouraging feature of the company's business at the present time was the extremely healthy growth of domestic orders. The future of the company, he said, did not depend, to the extent generally believed, upon its war orders.

EXPORTS OF GASOLINE FROM THE UNITED STATES

REPRESENTATIVES of the oil industry in New York claim that the high price of gasoline is due in large part to the enormous foreign demand and heavy export movement. Retailers and consumers dispute this claim, asserting that conditions do not justify it. Following are presented some facts concerning the export situation:

The total exports of crude oil and refined oil in 1915, according to the Government figures, amounted to $2,329,575,-617 gallons, an increase of almost 100,-000,000 gallons over the total for 1914. The amount exported in 1914 was 2,-240,033,652 gallons; in 1913, 2,186,565,-721 gallons. In two years, then, there has been an increase of approximately 200,000,000 gallons, slightly less than 10 per cent.

Exports of crude oil, gasoline illuminating oil and residuum were considerably less last year than in 1913. Exports of gas oil and fuel oil and naphthas, except gasoline, were approximately twice as large as in 1913. Exports of lubricating and heavy paraffine oil showed some increase. The following table shows the exports during a three-year period:

	1913.	1914.	1915.
Crude oil, gals....	194,569	124,735	158,263
Gas and fuel oil ..	358,008	634,298	799,646
Gasoline	117,728	162,669	112,560
Illuminating oil...	1,119,441	1,010,449	836,998
Lubricating oil...	207,639	191,647	239,719
Naphthas, except gasoline	70,315	47,028	169,770
Residuum	67,868	69,209	12,616
Total refined	1,941,996	2,115,298	2,171,312

Exports to the allied countries were generally heavier than in 1913, particularly of lubricating oil. Germany, which was a considerable factor even in 1914, did not receive any oil from the United States.

DOMINION TRADE WILL MARK RECORD.

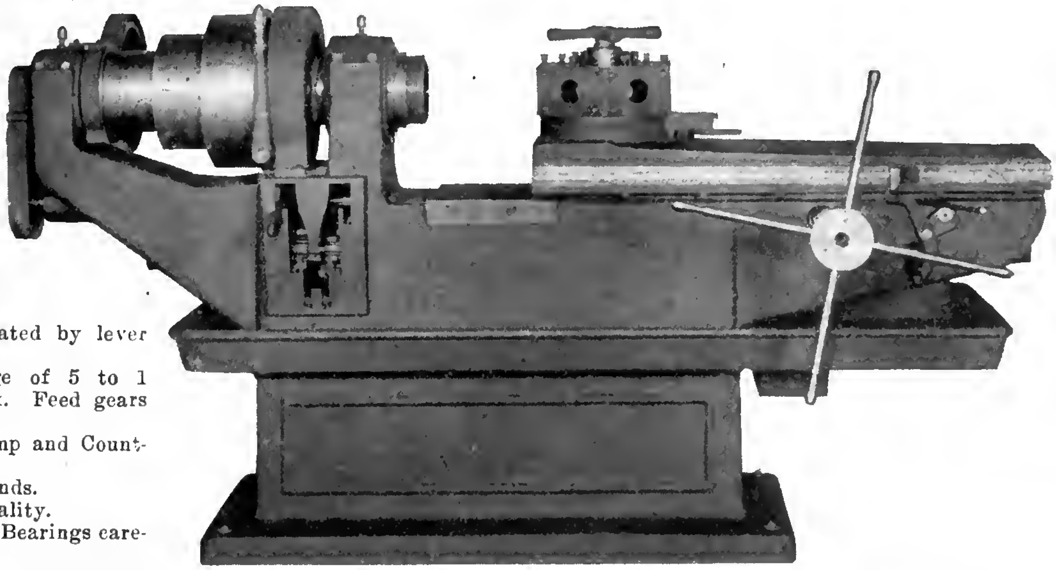
THE total trade of Canada for the fiscal year ending March 31 next will in all probability reach the record figures of one and a half billion dollars, according to the monthly trade statement issued by Hon. Dr. Reid, Minister of Customs, on March 16. The figures for the eleven months ended February last were $1,300,000,000, and March should easily bring the total up to the one and a half billion mark. The principal feature of the statement is the large increase in the volume of exports over the corresponding period of 1915, the domestic exports for the eleven months of the present fiscal year being $653,196,-000, compared wth $364,299,000 for the same months of 1915. The exports of February last were double those of February, 1915, being $58,000,000, against $28,000,000.

The export of manufactured articles again heads the list with $28,600,000, as against $8,900,000 for February, 1915. The exports of agricultural products for last February nearly doubled the export for February, 1915, being $13,000,000, against $7,000,000. There is an all round increase in other exports, with animals and their produce $5,500,000; lumber, etc., $2,500,000; minerals, $5,-

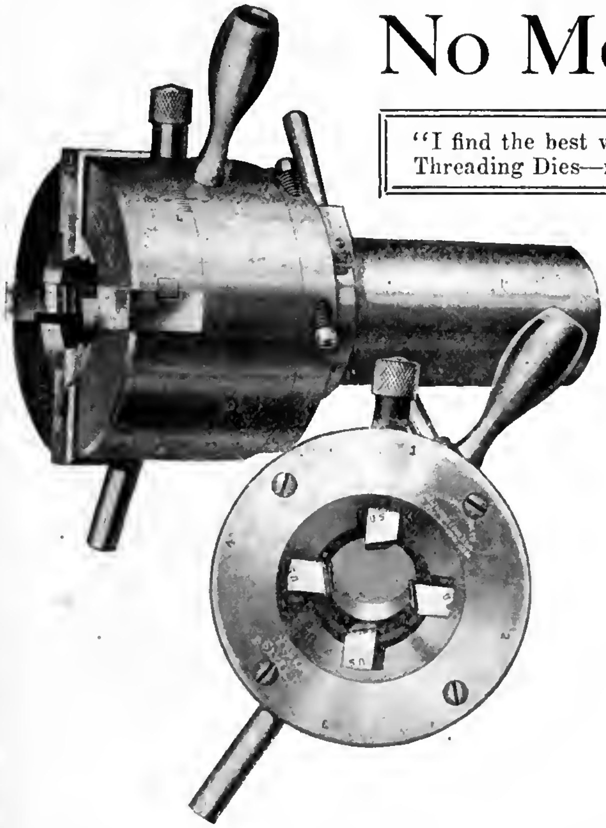
GREENSBORO TURRET LATHE

For Boring and Recessing Base of 4.5 and 6" Shells

Spindle is made of Carbon Steel, 8" diam. in front bearing and bored 6¼" diam. 8" deep, so part of shell is held within bearing to prevent overhang.
Spindle runs in heavy bronze bearings.
Head has friction back gear, 5½" belt.
Turret is bored for 3" Bars, has power feed with automatic stop.
Quick-change feeds operated by lever under head.
Turnstile has a leverage of 5 to 1 though gearing into rack. Feed gears made of steel.
Equipment: Oil Pan, Pump and Countershaft.
Weight: About 6,000 pounds.
Workmanship of Best Quality.
All Spindles ground. All Bearings carefully scraped.



THE A. R. WILLIAMS MACHINERY CO., LIMITED
TORONTO CANADA



No More Broken Threads

"I find the best way to get a full even thread is to use Geometric Threading Dies—no more broken threads."

The above comment was made by a Shop Foreman. His opinion is the opinion of every mechanic who has used Geometric Die Heads.

Geometric Self-opening and Adjustable Screw-cutting Die Heads are made with shanks to fit the turret of all makes of hand and automatic Screw Machines.

When you are ready, take up your threading proposition with us.

Get acquainted through our literature. Tell us the class of threading you have to do, and we will send booklet describing the proper tool to produce it.

The Geometric Tool Co.

New Haven :: :: Conn.

Canadian Agents:
Williams & Wilson, Limited, Montreal
The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg, St. John, N.B.

000,000, and fisheries, $1,800,000.

For the eleven months Canada exported as follows:—Agriculture, $231,000,000; animals, etc., $94,255,000; fish, $20,000,000; minerals, $58,000,000; lumber, $48,000,000; manufactures, $195,000,000. All these items show remarkable increases, particularly that of manufactured goods, the export for the under this head being $70,000,000. Imports for February last amounted to $51,654,000, of which $22,550,000 were free goods. For the eleven months last the imports were $445,748,000, of which $191,000,000 were free goods. Corresponding period of 1915 showed total imports of $414,959,000, of which $158,000,000 were free goods.

The Chapman Valve Mfg. Co., of Indian Orchard, Mass., have opened an office at 727 Traders Bank Bldg., Toronto with A. R. Roberts as representative.

Trade Gossip

Vancouver, B.C.—The Board of Trade have elected Nicol Thompson president and B. W. Greer vice-president.

Calgary, Alta.—The cement plant at Exshaw near here will recommence manufacturing in a few weeks.

The Canadian Ice Co.,Toronto, Ont., has been awarded a contract for installing a refrigeration plant by Smallman and Ingram of London, Ont.

Chatham, Ont.—The following officers have been elected to the Board of Trade: President, A. E. Taylor; vice-president, W. F. Cassidy; secretary, D. P. MacLachlan; treasurer, Howard McKendy.

Cobourg, Ont.—At the annual meeting of the Board of Trade the following officers were elected: President, W. J. Maher; first vice-president, W. W. Hooey; second vice-president, A. L. Jex; secretary-treasurer, T. S. Chatterton.

The Canadian Sarco Engineering Co., manufacturers of traps and other steam specialties, have opened an office at 727 Traders Bank Bldg., Toronto, A. R. Roberts, is president and general manager of the company.

Copper Bounty Proposed.—The Hon. Lorne Campbell, Minister of Mines for B. C. Legislature announced in the House that the Dominion Government was considering the proposal of a copper bounty for British Columbia, which would place the province in control of the copper and zinc output of Canada.

St. Catharines, Ont.—The City Council decided to strike a rate of 40 cents per 1,000 for the first 5,000 feet of natural gas, which the city has engaged to purchase from the Relief Gas Co. The rate after the first 5,000 feet is 35 cents. The rate charged by the company for the first 1,000 feet is 70 cents, with meter rental.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

St. George, Que.—G. P. Gonthier will build a foundry here, at an approximate cost of $4,000.

Shawinigan Falls, Que.—The Canada Carbide Co. will make extensions to its plant to double the capacity.

Ingersoll, Ont.—Preparations are under way for the installation of the new purification works at the plant of The Ingersol Gas Co.

New Toronto.—The Brown Copper & Brass Rolling Mills, Ltd., are having a brass rod and shape mill erected here which will cost about $125,000.

Toronto, Ont. — The National Equipment Co., manufacturer of gasoline engines, pumps, etc., is erecting a tank shop, in which new machinery will be installed.

Chatham, Ont.—The American Well Works Co. of Aurora, Ill., is putting its plant here in order, and installing machinery for the manufacture of pumping machinery, etc. F. J. Lukins is manager.

Grandmere, Que. — The Laurentide Co. will build an addition to its plant to double its capacity. Machinery will be installed in the addition and 15,000 h.p. additional will be required to operate the plant.

Sudbury, Ont. — The Sudbury Construction & Machine Co., is building additions to its plant, including a cupola house 30 x 40 ft., in which a new furnace will be installed and an addition 30 x 40 ft., is being made to the brass foundry.

Montreal, Que. — The Canada Iron Foundry Co., which completed a reorganization last fall, is contemplating building an addition to its plant at Three Rivers, Que. Either an entirely new plant will be erected, or a large addition added.

Saulte Ste. Marie, Ont.—The Great Lakes Power Co., a newly organized corporation composed of United States' capitalists have purchased the power plant and streeet railway belonging to the Algoma Steel Corporation. Plans drawn up by the Great Lakes Co. provide for improvement of the local power plant to the extent of nearly $3,000,000. The Great Lakes Co is reputed to have already been bonded to the extent of $2,200,000. It is planned to develop 30,000 h. p. in the completed plant, nearly all of which has already been contracted for by the Algoma Steel Corporation.

Electrical

Sarnia, Ont.—The electric light plant here will probably be taken over by the Hydro Commission

Wellesley, Ont.—An electric lighting and power system will be installed in this village at a cost of $7,500.

Toronto, Ont.—The Toronto Hydro-Electric System will build an extension to the Duncan Street sub-station.

Brantford, Ont.—The wireing of the City fire alarm system will cost heavily. Copper has been tendered for at $33.15 per 100 pounds, and there are 16 miles to be done. Two new alarms will be placed at a cost of $100 each.

Sarnia, Ont —The Hydro Commission of Sarnia is planning a lighting system for the waterfront including the frontage of the G.T.R. and Northern Navigation Co. One thousand Candle-power ornamental lights are planned for the business section, and a large number of nitrogen filled lamps for side streets. Railway and boat companies will also be asked to improve their river frontage.

Municipal

Calgary, Alta.—The incinerator which was recently destroyed by fire will be rebuilt.

Elmira, Ont.—Extensions will be made to the waterworks system. A. M. Bauman is the contractor.

Hamilton, Ont.—The City Council will purchase a motor fire truck from the National Steel Car Co., of this city. The price is $5,300.

Toronto, Ont.—The current estimates of the property department include $14,000 for an addition to the civic abattoir, including two boilers.

Barrie, Ont.—The Water and Light Commission contemplate installing a new pumping plant to replace the present one which is out of date. A new stand pipe will also have to be considered.

Calgary, Alta. — The Entertainment Committee of the City Council have recommended that the City appropriate $1,000 to assist the Board of Trade in a scheme to advertise the Calgary district. Mr. Campbell is secretary of the Board of Trade.

Kingston, Ont.—The City is now appealing to the Hydro-Electric Commission for power, since the latter has bought out the Seymour Electric Co., with which the local Utilities Commission was about to make a contract for power from the Trent River.

Toronto, Ont.—The estimates for the Fire Department include the purchase of an automobile for Chief Smith, two motor combination hose and chemical wagons, a motor hook and ladder truck, 7,000 feet of $2\frac{1}{2}$ in. fire hose, a fire tug and fire alarm telegraph.

General Industrial

St. Catherines, Ont. — Fire recently damaged the Cuthbert Pattern Works to the extent of $3,000.

Regina, Sask.—The Prairie Biscuit & Confectionery Co. are planning to erect a $50,000 factory here.

Toronto, Ont. — The York Knitting Mills are making an extension to their factory on Queen St., West.

Hamilton, Ont. — The Mercury Mills Ltd., propose erecting a knitting factory here at an approximate cost of $250,000.

Toronto, Ont. — The York Township Council wil extend the water distribution system. Cast iron pipe and hydrants will be required.

Carleton Place, Ont.—New machinery is being instaled at the Hawthorn Mills which will increase the capacity of the plant.

Linlsay, Ont. — The chemical Co. is awarding contracts for the supply of materials for the new factory. Mr. Hodgson is manager.

Lindsay, Ont. — Another industry, the Waddell Preserving Co., will shortly purchase or erect a factory here for manufacture of their products. The directors are: Fred W. Ryerson, president; W. E. Long, vice-president; J. A.

FORD-SMITH

27" x 19" x 7½"

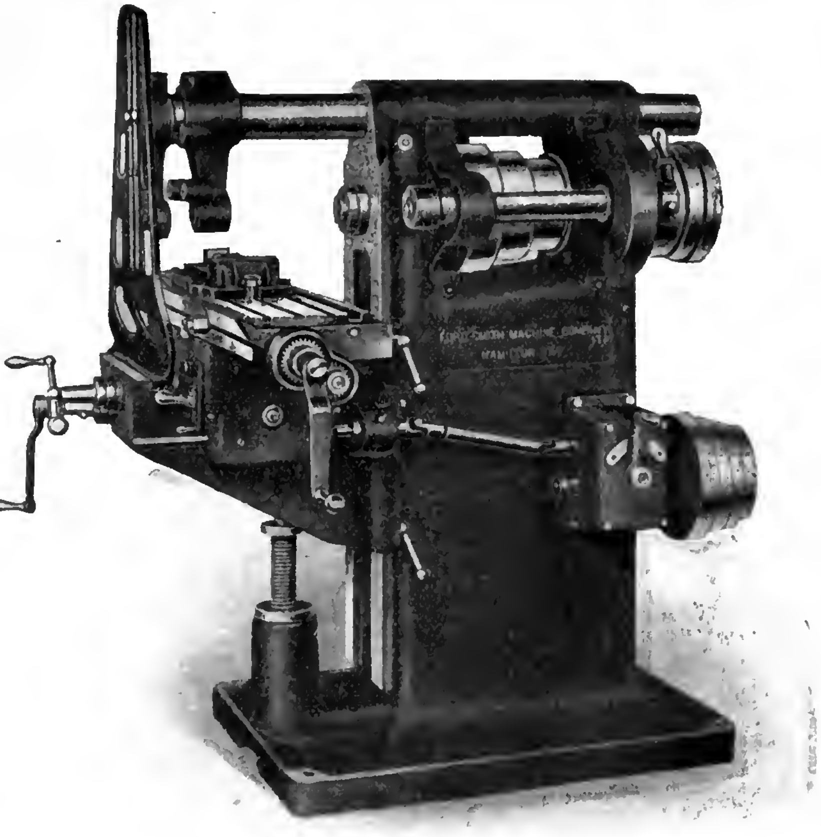
Milling Machines

Embodying the following distinctive features:

Large Amount of Power delivered to Cutter
Ease of Feed and Cutting Speed Changes
Centralized Control of Machines
Large Capacity of Table and Vise
Safety to Operator
Let us tell you the many other features in our New Special Bulletin.

WRITE US NOW

Ford-Smith Machine Co.
Limited
HAMILTON - - CANADA



BARNES-MADE PRODUCTS

SPECIAL
SPRINGS
AND
Screw Machine Products

MADE ON CONTRACT

to the most exacting specifications, and deliveries made as desired.

Ask for Booklet 6-T.

Established 1857.
THE WALLACE BARNES COMPANY
218 SOUTH STREET, BRISTOL, CONN., U.S.A.
Man'f'rs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

SINGLE PURPOSE LATHES

Open belt drive and back geared.

Early Deliveries

Plain, efficient manufacturing machines. Their cutting capacity will surprise you.

Himoff Machine Co., Inc.
132 Mott Street, New York

If any advertisement interests you, tear it out now and place with letters to be answered.

Waddell, managing director and secretary; T. E. Ryerson, treasurer.

Port Arthur, Ont.—The Saskatchewan Co-operative Elevator Co., of Regina, Sask., will build an elevator here with a capacity of two and a half million bushels. C. D. Howe, chief engineer of the Board of Grain Commissioners will design the elevator which will be constructed of reinforced concrete and will be equipped with modern drying and cleaning apparatus. C. A. Dunning of Regina is manager of the company.

Tenders

Halifax, N.S.—Tenders will be received up to Wednesday, April 5, for 5,000 feet of cast iron pipe. Specifications, etc., may be obtained at the office of F. W. W. Doane, City Engineer.

Quebec, Que.—Tenders for freight shed and grain galleries, will be received at the Quebec Harbour Commissioners' Office, Pointe-a-Carey Wharf, Quebec, up to April 15 next. Plans and specifications of the contemplated work may be seen at the Harbour Engineer's Office, Pointe-a-Carey Wharf St. George Boswell, Chief Engineer.

Toronto, Ont.—Tenders will be received by the Chairman, Board of Control City Hall, up to Tuesday, April 11, for the supply and delivery of: Electrically operated driving gear for operating 36-inch gate valves, at main pumping station, John Street. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont.—Tenders for underground work, addressed to the chairman Toronto Electric Commissioners, will be received until Tuesday, April 4. Details of work to be performed, consisting of laying of cable ducts, building man-holed and transformer vaults. Specifications and form of tender may be obtained at the Engineering and Purchasing Department, 15 Wilton Avenue.

Vancouver, B.C.—The British Columbian Fisheries, Ltd., will sell their entire plant and equipment, including buildings, machinery, tools, refrigerating plant, sawmill and machinery, fertilizer plant and equipment, power plant equipment, steam trawlers and scows, etc. Tenders will be received up to April 15, and full particulars may be obtained from James Keppel Ball, Yorkshire Building, Vancouver, B.C.

Collingwood, Ont.—Tenders will be received by the Chairman of the Collingwood Water and Light Commission until Tuesday, April 11, for the following works—(1) Pumping machinery, comprising two motor-driven units, 1,000 Imperial gallons capacity each. (2) Pump well and connections. Plans and specifications may be seen at the office of the Chipman and Power Engineers, 204 Mail Building, Toronto, or at the office of the Water and Light Commission, Collingwood, Hugh A. Currie, chairman.

Ottawa, Ont.—Tenders will be received until Tuesday, April 4, for the purchase of the following scrap metals: Lot No. 1.—Mostly flat iron, approximate weight, 8,000 lbs.; Lot No. 2.—Conduit and gas pipe, approximate weight 800 lbs.; Lot No. 3.—Miscellaneous wrought and cast iron, approximate weight 20,000 lbs.; Lot No. 4.—Wrought iron pipe, approximate weight, 7,000 lbs.; Lot No. 5.—Gas pipe and conduit, approximate, 600 lbs.; Lot No. 6.—Galvanized iron pipe and wrought iron pipe, approximate weight, 1,600 lbs.; Lot No. 7.—Structural iron (straight), approx. weight, 12,550 lbs.; Lot No. 8.—Structural iron (twisted approx.), weight, 32,000 lbs.; Lot No. 9.—Rod iron, approximate weight, 1,000 lbs.; Lot No. 10.—Sheet copper, approximate weight, 23,800 lbs.; Lot No. 11.—Brass, approximate weight, 100 lbs. The above material can be examined any week day, between 10 a.m. and 4 p.m., on the Parliament Grounds, to the rear of the Parliament Buildings, by applying to the Public Works Officer-in-charge of the Buildings, Room 21, House of Commons, West side. R. C. Desrochers, secretary, Department of Public Works, Ottawa.

Railways—Bridges

Hamilton, Ont.—In order to overcome the difficulty in securing a proper entrance to the city of Hamilton, a bridge 1,400 feet in length will be erected by the Toronto-Hamilton Highway Commission. The highway and the Hydro radial will both run over this bridge.

The Buffalo Fort Erie Ferry & Railroad Co., is seeking power to acquire and take over the assets and property formerly owned by the Buffalo & Fort Erie & Ferry Railway Co., now owned by Frank V. E. Bardol. The provisional directors are: Frank V. E. Bardol, Alex. Fasken and James Oscar Bucklay both of Toronto. The capital is $500,000, and the head office of the company is to be at Fort Erie, Ont. The company seeks authority to extend the line to Port Colborne through the southern portions of the townships of Bertie and Humberstone, and between the Buffalo and Goderich division of the G.T.R. It also proposes to extend the line from Fort Erie to Chippewa by way of Bridgeburg.

New Incorporations

The John Dickinson & Co., has been incorporated at Toronto, Ont., with a capital of $40,000 to carry on the business of paper manufacturers and wholesale stationers at Toronto, Reginald G. Allder of Toronto is Attorney.

The National Mines Ltd., has been incorporated at Toronto, Ont. with a capital of $2,000,000 to acquire and develop mineral lands and deposits at Cobalt, Ont. Incorporators, John Albert Rowland, Dunbar Tyler and David H. Stewart all of Toronto.

The Waddell Preserving Co., has been incorporated at Toronto with capital of $40,000 to manufacture all kinds of jams, and canned goods, etc., at Brantford, Ont. Incorporators, James Harley, Edmund Sweet and A. M. Harley all of Brantford, Ont.

The Hodgson Brothers Chemical Co., has been incorporated at Toronto, Ont. with a capital of $200,000 to manufacture and distil, methylate, chemicals and spirits, etc. at Lindsay, Ont. Incorporators, Thomas Hodgson and Jas. Irwin Harrt of Lindsay, Ont.

The Consumers Heating Co., has been incorporated at Toronto with a capital of $100,000 to construct and operate works for the production and distribution of steam and hot water. The head office is at Toronto, and the Incorporators, Dixie Cox Cotton, George Alexander Tee and Harry A. Colson all of Toronto.

Contracts Awarded

Montreal, Que.—The contract for the erection of an addition to Darling Bros., factory, has been awarded to A. F. Byers & Co. Estimated cost, $19,000.

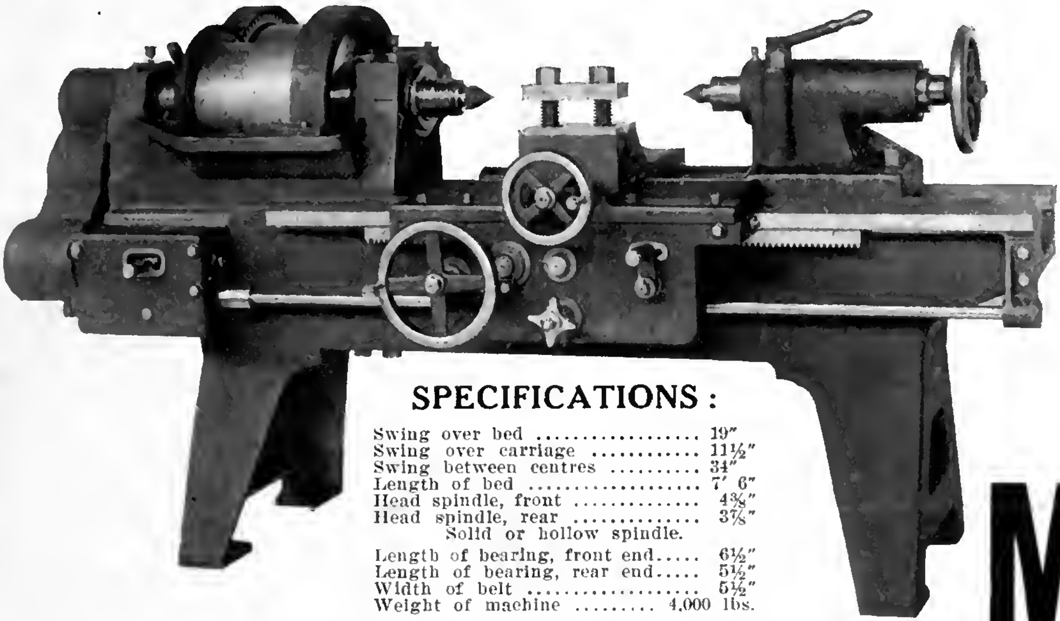
The William Hamilton Co., of Peterborough, Ont., have been awarded a contract for hydraulic equipment by the Portneuf Hydro Electric Co., of St. Albans, Que., for the new power plant.

Toronto, Ont.—The contract for the erection of a radial brick chimney at the Don incinerator has been awarded by the Board of Control to the Canadian Custodis Chimney Co., Toronto, at $10,070.

Hamilton, Ont.—The City Council have awarded the following contracts for supplies for the year:—Brass work, the Tallman Brass Co., cast iron pipe Gartshore-Thompson Pipe & Foundry

The "Duplex" Heavy Duty Engine Lathe

Can also be supplied with 4 or 6 side Turret.



SPECIFICATIONS:

Swing over bed	19"
Swing over carriage	11½"
Swing between centres	34"
Length of bed	7' 6"
Head spindle, front	4⅜"
Head spindle, rear	3⅞"
Solid or hollow spindle.	
Length of bearing, front end	6½"
Length of bearing, rear end	5½"
Width of belt	5½"
Weight of machine	4,000 lbs.

10 READY FOR PROMPT DELIVERY

Guaranteed to rough turn six-inch steels.
As good as any and better than many.

MODERN MACHINERY MART
152 Bay Street,
TORONTO

SAWS FOR SHELLS

We have experimented on the

SPECIAL SHELL STEEL

and have produced a *HACK SAW BLADE* that will give unequalled service on this material in *HIGH-SPEED MACHINES.*

Possibly we could help you.

"VICTOR BLADE—CANADIAN-MADE."

Victor Saw Works, Ltd.
Hamilton, Ont.

VICTOR HACK SAWS Get a Box and Try 'em

BE READY

If you wish to take advantage of the extensive "Made in Canada" campaign, prepare to meet competition by consulting our expert engineer for the manufacturing of your special machinery.

LYMBURNER, LIMITED
Commissioner and Berri Sts., Montreal

Co.; iron castings Brown-Boggs & Co.; extension boxes Forwell Foundry Co.; belting, Sadler & Haworth.

Building Notes

Vancouver, B.C.—The Ford Motor Co., of Canada has purchased a site and will erect a four-story building of brick and concrete, 110 x 115 feet. W. G. Patrick is local manager.

Winnipeg, Man. — Arrangements for the building of the rear portion of the new city hall are now being seriously considered by the Board of Control. The work is expected to cost in the neighborhood of $200,000 which covered by a loan at 5½ per cent., would cost the city $11,000 per annum, but would bring all the departments under one roof.

Marine

Port Arthur, Ont. — The ice-breakers are making good headway, and it is expected they will cut a channel to the open water of Lake Superior by the end of the week.

Victoria, B.C.—To replace the tender Quadra, sunk in collision with the Charmer at the entrance to Nanaimo Harbor, the Dominion Government has decided to charter a suitable vessel to work in conjunction with the tenders Estevan and Leeboro. The steamer will be in buoy, beacon, and lighthouse work along the British Columbia coastline.

Refrigeration

Lethbridge, Alta.—A deal has practically been closed for a site near North Lethbridge on which P. Burns & Co., the packers will build an abattoir to meet the needs of their growing business in Southern Alberta.

Wood-Working

Wyoming, Ont. — William Travis is considering the construction of a planing mill, at an estimated cost of $4,000.

Personal

Robert Davies proprietor of the Don Valley Brick Works, Toronto, Ont, died on March 22, aged 67.

William R. Waghorne, manager of the Hydro-Electric System at Wallaceburg, Ont., died on March 23.

G. L. Pearsons has been appointed secretary and general manager of the Goderich Elevator & Transit Co., Goderich, Ont.

J. McCormick, for the past nine years connected with the sales department of Mussens Limited, Montreal, has resigned, having accepted a similar position in the machine tool department of the Canadian Fairbanks-Morse Co., of Montreal.

W. J. Curle, of Toronto, has been appointed general manager of the C., W. and L. E. Railway, to succeed the late William Norris. Mr. Curle was formerly connected with the C. P. R. and C. N. R., the latter road having control of the C., W. and L. E. R.

Mark Workman, President of the Dominion Steel Corporation has left Montreal on a trip of inspection to the Company's coal and steel properties in the East. He will be away for some time, his intention being to make a thorough survey of the properties, particularly the recent extensions.

Trade Gossip

Cobalt Ore Shipments.—Following is the official list of Cobalt ore shipments, in pounds, for the week ending March 24; Peterson Lake, 68,878; McKinley, 83,731; Penn-Canadian 97,883; Buffalo, 61,895; Dominion, 172,000; Townsite City 82,091; Cobalt Lake, 87,000; Nipissing, 129,780; Tamiskaming, 61,000; Beaver, 65,019.

Armstrong Whitworth of Canada Ltd., Montreal, Que., have opened a sales office in the Dominion Bank Bldg., Toronto, in charge of J. L. Hynes who is acting as representative for Toronto and district. This has been done with a view of giving individual attention to the business and extending the company's connection.

The Turbine Equipment Co., Toronto, Ont., have sold to the town of Mount Forest, Ont., a De Laval centrifugal pump having a capacity of one million Imperial gallons per day and to be operated by a 50 h.p. Canadian Westinghouse motor. This equipment will be installed in the waterworks pumping station.

Controlled Factories in Britain.—The Minister of Munitions announces that he has made an Order under Section 4 of the Munitions of War Act, 1915, declaring 218 additional establishments to be controlled under the Act, as from March 6, 1916. A total of 3,052 establishments have now been declared as controlled under the Act, from the date of the first Order, July 12, 1915, to March 3, 1916, inclusive.

The Canadian Car & Foundry Co., of Montreal, have secured a large order for freight cars from the French Government, the value running into several million collars. The order follows one of

two thousand freight cars for the French Government, closed last December. The new contract, with equipment orders now on hand amounting to about $5,000,000, promises continued activity in the company's car shops for some months to come, altogether apart from the shell business. The Russian shell order, it is stated, is working out satisfactorily, shipments going forward at regular intervals and without further technical or financial difficulties.

GERMANY'S TRADE AFTER THE WAR

THE situation of the German iron and steel industry at the present time is reported to be exceptionally firm and enjoyed a production exceeding 1,000,000 tons of pig iron and steel per month, after an output of 11,790,000 tons in 1915, says the "Engineer." There seems no reason for doubting that a considerable quantity of iron and steel is now being used, apart from the continued demands of the army authorities, in the production of many articles which were formerly made of copper and other metals.

In the confident expectation that the production of pig iron will be maintained after the war, and possibly brought up to the level of 19,310,000 tons which was reached in 1913, the general manager of one well-known steel company recently stated that from the experience gained in the autumn of the first year of war enormous stocks of ammunition were necessary, so that the manufacture of munitions would continue after the war, especially as Turkey and Bulgaria were dependent upon Germany for their supplies. In addition to these requirements the Germans declare that extensive deliveries which have long been desired by some neutral countries will then have to be executed, and that Europe after the war will be comparable with a great arsenal, in which each country will accumulate large stocks of munitions in accordance with the lessons taught by the war, "it probably depending entirely upon Germany as to how far the country is willing to extend her deliveries to foreign States.

Raw Materials Supply

The question of the supply of raw materials after the war is naturally intimately connected with that of the manufacturing industries from the standpoint of the resumption of the latter and their development. Apart from large purchases of copper, cotton, agricultural machinery and tractors which are reported from the United States to have been made in that country by German agents and to have been already in part loaded on the ships interned in the ports, the War Committee of German industry, on

the one hand, and industrial and official circles in Austria on the other, are at present occupied with the problem.

At a recent meeting of the War Committee held in Berlin, when 200 manufacturers from all parts of the country and representatives of the Ministries for Foreign and Home Affairs and of War were present, it was unanimously resolved to deal with the matter by the formation of sub-committees representing the varied interests of trade and industry, shipping and the large banks, and in close association with the Government Departments. Beyond this statement the proceedings were of a confidential character. On the other hand, less reticence has so far been observed in Austria, as the question was fully discussed at a recent gathering of the Industrial Club in Vienna, when speeches were delivered by the president of the Central Association of Austrian Manufacturers, the secretary of the well-known Austrian Commercial Museum, and representatives of the Ministry of Commerce.

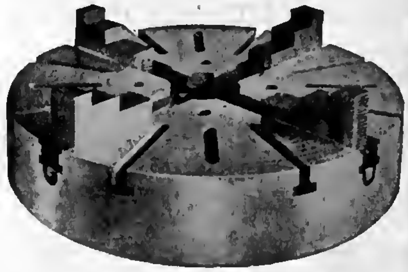
The chief idea, which is also that which prevails in Germany, was that syndicates should be formed with the assistance of the banks for the purchase of raw materials for distribution among consumers so as to minimise the difficulties and dangers which would arise in procuring them, and thus preventing excessive upheaval in the changing over from war work to peace pursuits. The aid of the Government was desired to some extent, but doubts were entertained as to the wisdom of the State exercising great influence in the matter.

HUGE TONNAGE LOSSES THROUGH WAR

THE European war has taken from the seas more than 200 merchant vessels of nearly 4,000,000 tonnage, according to figures published on March 20, by the Department of Commerce, Washington, Germany, with 600 vessels, sunk captured or detained, heads the list of losers.

Two hundred and twenty-five of the 500 British vessels lost were sunk by submarines. Through mines the Allies lost 167 ships, Austria lost 80, and Turkey 124. The total of neutral losses is put at 736, but most of these were released after being reported captured. Ninety-two neutral vessels have been submarined and 94 sunk by mines.

Great Britain has lost, according to the sources of information available 485 ships, with a total tonnage of 1,506,415. The Allied countries of France, Italy and Russia have lost altogether 167 ships with a tonnage of 282,187. The number of German ships lost by cap-



ture or sinking is 601, with a total tonnage of 1,276,500.

Eighty Austrian merchant vessels have been lost, making a total tonnage of 267,664. There has been 124 Turkish ships lost, but no adequate estimate of the tonnage has been secured. Neutral ships have been sunk to the number of 736, with a tonnage of 441,472.

AUSTRALIA'S METAL INDUSTRY

ADDRESSING a meeting in Queensland recently, Mr. Hughes, the Australian Prime Minister, referred to the mining industry. He said that when war broke out, for all practical purposes, the entire base metal trade of Australia was in the hands of a great German combine, whose tentacles extended all over the civilised world. This great German organization manipulated the market to suit itself. In Australia the position was that the war at one blow had closed all old channels along which base metals ordinarily found their way to the market. This trade represented at least £15,000,000, yearly, excluding the value of gold and silver, in base metals.

The policy of the Government, which was to encourage the industries of Australia, had resulted in largely extending the facilities for treating lead, zinc, and copper ores within Australia. All copper goods required in Australia would shortly be manufactured there. When the war ceased, Australian industrial activities would be greatly increased. It would be to Britain and her Allies only that the metal industry of Australia would look for markets. In every direction generally the Government would vigorously push that policy. Australian goods would take the place of German. A national laboratory was to be established, and the services of the best scientific men available would be secured.

Catalogues

Buffing and Polishing Wheels.—Bulletin 200 deals with various types of buffing and polishing wheels made by the Munning-Loeb Co., Matteawan, N.J. The selection of raw materials for buffing wheels and their manufacture is dealt with fully. The principal feature of the various types and grades of wheel are described in detail, while price lists, dimensions and weights are also included. The different types of wheel are illustrated.

Screw-Driving Machines.—The Reynolds Pattern & Machine Co., Moline, Ill., have issued a bulletin dealing with the Reynolds automatic screw-driving machine for wood or machine screws. A general description is given covering the principal features of these

machines and method of operation. This is followed by a number of illustrations, showing the various types, accompanied by a brief description of each, stating the class of work for which they are adapted. The bulletin includes a list of users.

Steam and Air Motors.—The Dake Engine Co., Grand Haven, Mich., have issued an attractive catalogue describing an interesting line of steam and air motors, hoisting engines, stearing gears, capstans, windlasses, etc. The power-driven machinery dealt with in the catalogue is driven by the Dake square piston engine, which is fully described. Each type of machine is illustrated and featured, and the principal dimensions given for each size. The Dake marine line is dealt with in a separate section of the catalogue, and includes various types of power-driven deck machinery.

Book Review

The Briitish Dominions Year Book, 1916, published by the British Dominions General Insurance Co., 1 Royal Exchange Avenue, London, England. This useful and interesting publication is edited by Edward Salmon, F.R.C.I., and James Worsfold, F.C.I.S., and is a successor to "War Facts and Figures," issued by the company last year. The book contains primarily a long series of interesting articles written by well known authorities, dealing with various phases of the war and other subjects of national interest. Among the articles may be mentioned: "The First Year of the War," by E. Charles Vivian; "The Imperial Navy," by the late Fred T. Jane; "The Cost of the War," by Edgar Crammond; "The Rally of the Dominions," by Edward Salmon; "A Business-like Empire," by Sir Leo Chiozza Money; "How the British Army is Organized for War." by Henry Neville; and other articles, all of special interest at this time. The book also contains a series of shorter articles dealing with various subjects, such as a few facts concerning the countries of the world, including the British Empire, "Who's Who in the War," a list of V.C.'s awarded up to September 11, 1915, and other information and statistics, each of special interest. The book also contains four maps, several diagrams and colored plates, showing medal ribbons and badges of rank for the army and navy. There are 336 pages altogether, including a list of contents and index. It is perhaps the most interesting publication of its kind that has appeared since the war started, containing as it does a fund of useful information and views on many subjects pertaining to the war by reliable authorities.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, APRIL 6, 1916 No. 14

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Machines and Methods Used in Spectacleware Manufacture

Staff Article

The successful production of high-grade spectacleware at competitive prices is largely, if not wholly dependent on a wide knowledge of tool room practice, combined with inventive resourcefulness in the adaptation of manufacturing methods. It is interesting to note that Canadian manufacturers of spectacleware are not only able, as a result of these conditions, to meet competition from all quarters, but supply as well a considerable proportion of the world's requirements and these of a widely diversified description to suit all races of mankind.

MODERN spectacleware is a product which for its successful manufacture depends very largely on the resourcefulness and skill of the tool room staff. Occasional operations other than straight machine work enter into the work—cable winding, soldering, plating, etc.,—but about 95 per cent. of the shaping, sizing, and similar work is dependent on machine shop methods and devices for profitable production.

The material used for the goods is a yellow composition metal, gold cased, and obtainable in the form of sheets, rods, wire, etc. The conventional design of spectacle frame is shown in Fig. 1., the lenses being encircled by metal eye-pieces, and thin side wires or temples with thick ball-ended curves being hinged at the end piece as shown.

Eighty operations more or less, are required on a frame of the type illustrated. Many of these at first sight seem almost trivial, but the cumulative effect is observable as the work progresses, and when the finished product is inspected, the value of each step becomes still more apparent.

Component Parts

The work is divided into four distinct groups which are gradually assembled together at various stages, i.e., end-piece, eye-piece, bridge, and temple. The end-piece shown in Fig. 2, is formed from flat stock of a suitable section, gold-cased on both sides and stamped out in such a manner that the casing of gold is retained on the tapered edges shown. These end-pieces are really two pieces formed in one, the advantages of this method over the former method of separate stampings being evident to anyone experienced in press work.

VIEW OF STAMPING PRESSES AND BENCH MILLERS.

Views (a), (b), (c), (d), Fig. 2 show the principal stages in making and assembling the end piece. After being stamped (a), a groove is milled, the eye-piece held in position and the sides of the groove pinched so as to hold tightly in place while being soldered, the latter operation being accomplished by holding the work in the flame of a small bunsen burner and touching heated parts with hard wire solder to complete operation.

The milling of the groove and the pinching of the end piece are both done in the one machine see Fig. 3. It consists of a gear driven spindle carrying a small convex milling cutter about 1-16 in. thick, the spindle being mounted in a swing frame hinged on the shaft which carries the belt pulley at the back of the machine. The front part of the frame forms a handle which is gripped by the operator when bringing the cutter into action.

The end-piece is placed between two small jaws or dies which are inserted into a hole in the work table, being clamped tightly in place by a pedal underneath the bench. The frame is now swung down, causing the cutter to groove the end of the work so that the eye-piece can be assembled in place. The operator holds the wire ring, which forms the eye-piece, so that the joint in the ring is in the centre of the thickness of the end-piece, see (b) Fig. 2. Pressure on a pedal now causes the jaws on either side of the work to advance and pinch sides of the grooved end-piece so as to make it grip tightly on the ring after which it is finally secured by means of soldering.

Eye-Piece

The wire of which the eye-piece is formed is circular in section, and is close-wound on a coiling mandrel, the size of which is accurately determined so that the wire, when released, will

VIEW OF ASSEMBLING DEPARTMENT, SHOWING GAUGING, STRAIGHTENING, INSPECTION, ETC.

spring to a size just a shade smaller than the diameter of the slitting mandrel. This is necessary so that when slipped on to the slitting mandrel, the coil will be opened very slightly, with the result that after being slit, the ends of each ring will lie snugly together.

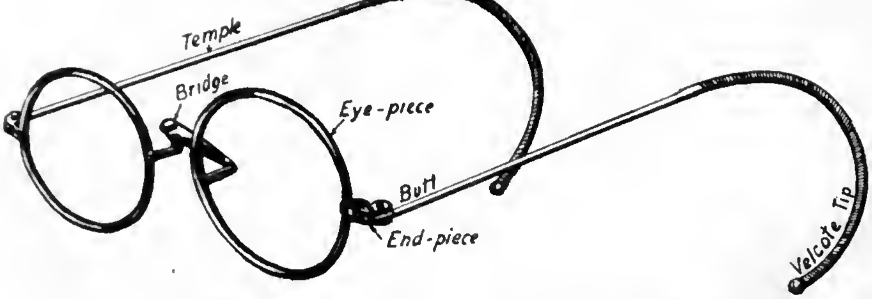


FIG. I. MODERN SPECTACLE FRAME WITH VELCOTE TEMPLES.

If the ends of the rings should hang apart, and not be held together by the operator when assembling with the end piece, the finished eye-piece would be too big for its lens.

Before coiling, the wire is passed through rolls which form a groove on one side of it, and when being coiled, the wire is passed between tension blocks of hardwood, which also guide it so that the groove is accurately located on the inside of the ring. When transferred to the slitting mandrel, the coils are clamped between two plates, as shown in Fig. 4. Two grooves are provided on the mandrel—one on top for clearance for the slitting saw, and the other exactly opposite for marking a point on the inside of the frame by means of the strip shown in upper part of the illustration. This strip has a small knife-edge projection at one end, which is undercut so that it can be sprung together when entering the slot, and as it is drawn through, it marks each eye-piece in passing.

End-Piece

The soldered end-piece is now placed in a die and struck so as to set it truly radial from the centre of the eye-piece, after which it is sawn through the centre thus splitting the ring and enabling access to be had to the face of each piece for the purpose of indenting a small D-shaped depression, and piercing two holes the size of which varies according to whether it is the upper or lower half (c). The outer end of the end-piece is next reduced in thickness by an amount equal to half the thickness of the end of the temple which is later assembled at this point. The cut is taken at an angle, as shown at (d) but as will be observed it does not entirely remove the D-shaped depression in (c). The space left by this depression provides clearance for the end of the temple, Fig. 5. In order to form points (x) and (y) which act as limiting stops for the swing of the temple, the cut is carried straight across as shown. This cut is made with a horizontal end mill, the work being held by hand with the end piece supported in a suitably shaped depression in a die block.

The machine used for this milling operation is of a type adaptable to various operations and is illustrated in photo Fig. 3. It consists of a swinging frame carrying the spindle which is gear-driven from the pulley shaft, the swing frame being hinged on the bearings of the shaft.

Piercing and Tapping

The end pieces are now ready to have the screw and dowel holes made. Fig. 6 shows the two halves of the completed end piece with dowel pin in lower half. The fillister head screw is shown, along with a plate used during assembly operations. Each half of the end piece has the holes punched in a separate fixture, the supporting die having an accurately fitting recess in which the end-piece rests. The end-piece rests on its flat or outer side while the eye-piece is sprung sideways by hand to clear the punch. Tapping the screw hole is now done in a special machine of simple design. Fig. 7 shows the principle on which it operates. A solid tap is held in the spindle chuck while the end-piece to be tapped is held by hand in a slot cut in the side of the tailstock spindle. This allows the spindle to be used with the hand feed for engaging the work with the tap, the work being kept square by the back face of slot. A hole in the centre of the spindle is made to allow clearance space for the tap. The main spindle is carried in two bushings supported in the headstock, and forming part of the belt pulleys, each of which is coned on one side to engage with a double-sided cone on the spindle. When the work is pressed against the tap, the main spindle slides back till it engages with the rear cone which thereupon revolves the tap in the hole, the work being followed up lightly with the hand feed. When the tap is through far enough, the hand feed is pulled back, causing the work to disengage the spindle from the rear cone and pull it into the front one. The cross belt on this cone pulley reverses the tap and runs the work off.

Counterboring and Dowelling

In counterboring the hole the work is held flat on a block. A small spring plunger pin projects above the surface for the purpose of locating the hole under the drill spindle, see Fig. 8. The vertical tube at the side of the spindle is fastened to the table and acts as a guide for a finger clamp which is pressed down by the spindle and, being spring supported, allows the counterbore to travel to the desired depth. The counterbore has a short pilot which as it descends forces the locating pin down into the block.

After reaming the dowel pin holes, the dowel pin is inserted. A slight gash or dent is made on the portion of it which is fastened in the end-piece, and after being forced into the hole, the metal is compressed around it by a small revolving tubular tool similar to rotary riveting. The dowel pin is therefore keyed into place and cannot be removed without considerable risk of damaging the end piece. The small plate shown in Fig. 6 is of steel and the same thickness as the end of the temple. It is now put on the dowel pin, the screw tightened up, and an accurate blow delivered to the end-piece in a die, which strikes up both sides flat, with end of pins flush, etc.

The ends of the eye-piece may not be accurately matched so far as the groove is concerned, so a small round edge cutter is used to clean out any surplus solder and continue the groove past the joint in good shape.

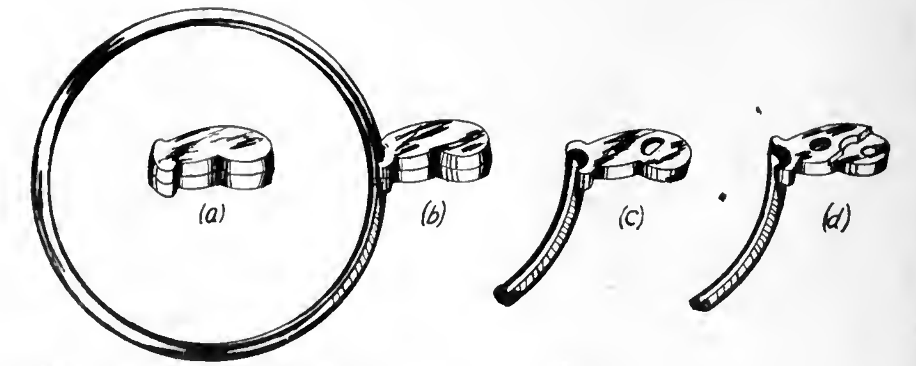


FIG. 2. END-PIECE IN DIFFERENT STAGES OF COMPLETION.

Bridge

The bridge is now assembled with the

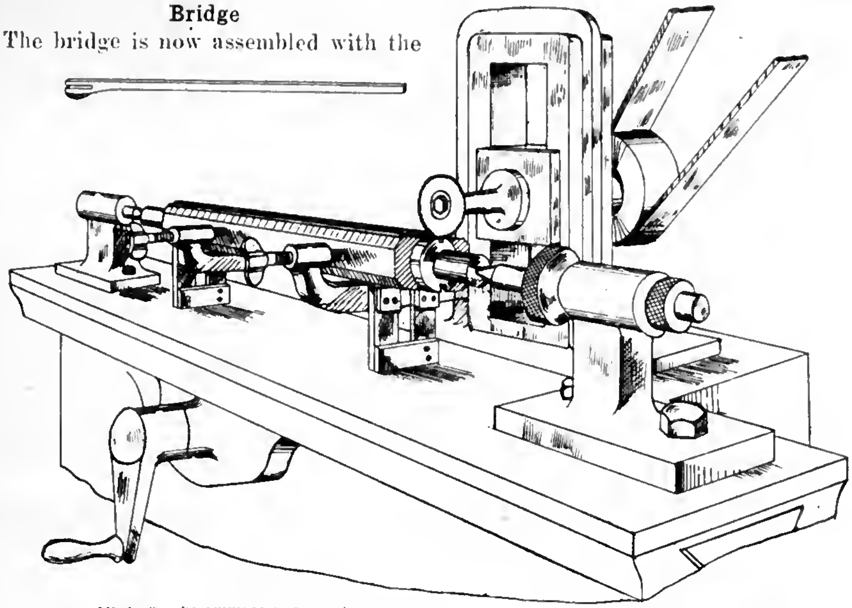
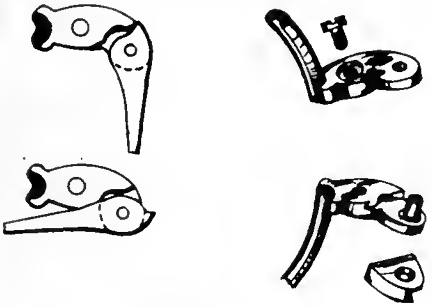


FIG. 3. SLITTING COILS OF WIRE TO FORM EYE-PIECES.

eye-pieces, being soldered in position as shown in Fig. 9. The upper portion as this illustration shows the various stages



FIGS. 5 AND 6.

in the manufacture of the bridge. Reference was made to a mark which was made on the inside of each eye-piece before it was cut off on the coiling arbor. That mark indicates the spot on the outside of which the bridge is attached. After cleaning, the soldered joint is bumped in the press to flatten out the joint, after which the eye-pieces are stretched on an expanding block which sets them to an oval shape of the desired size.

The bridge must now be bent to shape, this operation being done in a specially built machine which allows of any desired proportions being imparted to the bridge. A photograph of this machine is reproduced in Fig. 10, while a sketch showing the three positions of work is given in Fig. 11. At (a) is shown the work as it is when placed in the revolving jaws. When handle A, Fig. 10, is swung round to the right, the jaws are caused to revolve through a quarter turn, bending the work as at (b) Fig. 11. Handle B, Fig. 10, is now pressed forward causing the round nosed forming plate to bend the bridge into the familiar shape as shown at C, Fig. 11. Handle C, Fig. 10, is drawn forward and sets the bridge to the desired angle by means of the small pin shown, the travel being adjustable for various angles of bridge.

After being brushed and cleaned, the temples are fitted to the frame, following which a buffing and final cleaning completes the work.

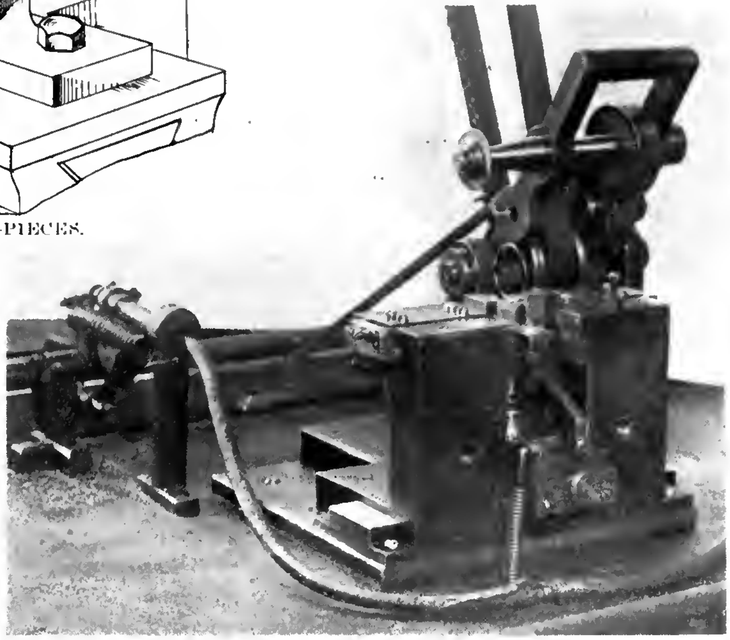


FIG. 4. SWING TYPE BENCH MILLING MACHINE WITH SLIDING JAWS FOR CLAMPING END-PIECE.

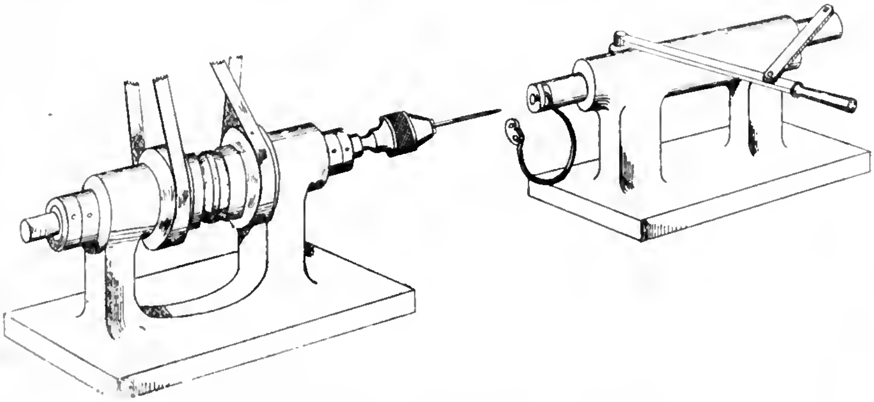


FIG. 7. DEVICE FOR TAPPING END PIECES.

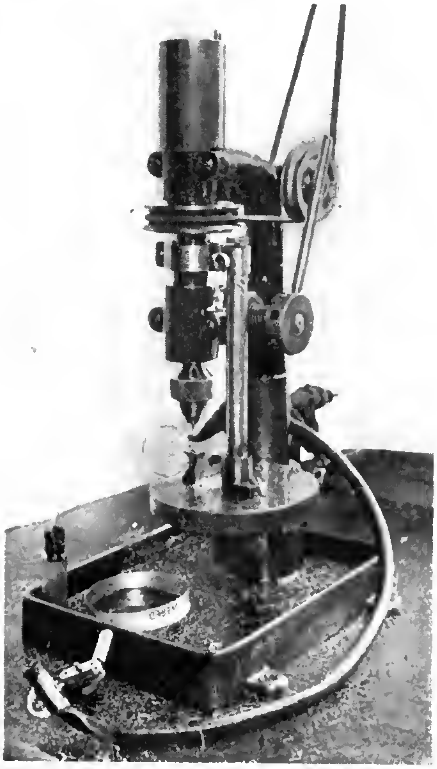


FIG. 8. DRILL PRESS WITH AUTOMATIC SPRING CLAMP FOR HOLDING DOWN WORK WHILE COUNTERBORING.

Making Temples

The temples or side wires as they are perhaps more frequently spoken of, may be of several types such as a solid wire, cable wire, or velcote—a combination of

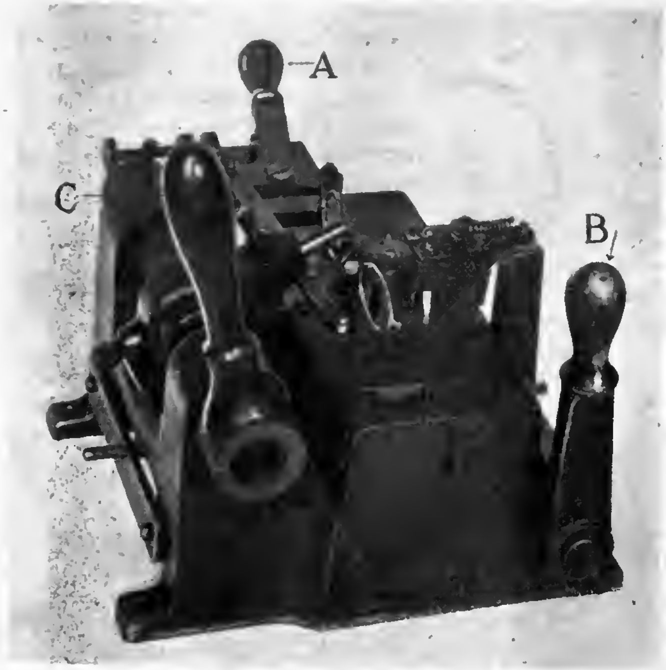


FIG. 10. MACHINE FOR BENDING BRIDGES, SHOWING FINISHED ARTICLE IN JAWS.

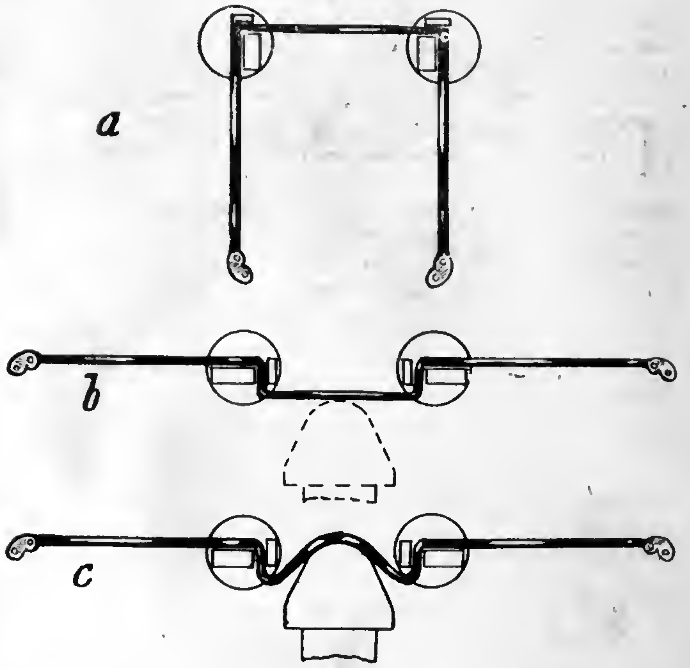


FIG. 11. ILLUSTRATING ACTION OF BRIDGE BENDING MACHINE.

wire and cable. The latter type is the one shown in the illustration of the complete frame. The construction is explained in Fig. 12. The velcote is built

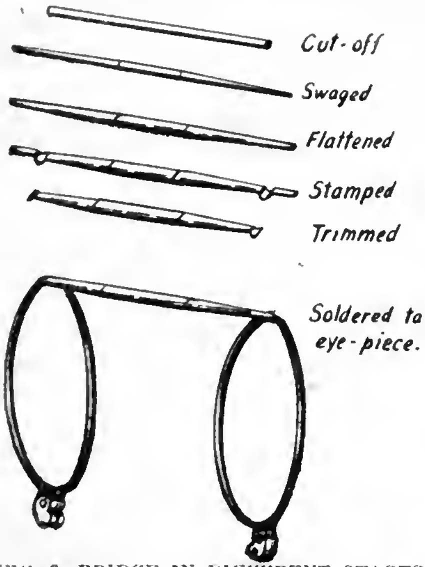


FIG. 9. BRIDGE IN DIFFERENT STAGES OF COMPLETION.

up of nine wires, four of these being wound round a single wire to form the core. An outer layer of gold-cased wire is next laid on, four wires wide, after which pieces of the velcote are cut to length, pointed to fit the countersunk end of the butt and soldered. Two swagings and annealings are now performed to hammer down the soldered joint and drawn out the butt to a thin wire. A third swaging without annealing, imparts a finished surface and shape and leaves the metal hard and strong. The velcote is swaged also, the effect being to pack the coils of wire closely together, and impart a smooth finish.

The butt is then stamped flat, pierced, trimmed, and finally flattened to the thickness of the wire.

The ball end is now put on, this being formed from a flat blank, cupped, assembled on velcote and stamped in hemispherical dies. After being assembled with the frame, the velcotes are bent to shape by being twisted round a small spindle, the coils being made right and left-handed. In order to make the velcotes retain their curved shape a burnishing tool is worked across the inside surface of the curve, the resulting surface hardness having the effect of causing the velcote to resume its curved-shaped even if stretched out straight.

The final operations are all performed by hand and consist of gauging various dimensions, straightening, centering, sizing, etc.

The methods and devices illustrated are in use at the Toronto factory of the Consolidated Optical Co., to whose superintendent W. Beck, we are indebted for assistance and information in preparing this article.

National Machine Tool Builders' Association.—The executive committee of the National Machine Tool Builders' Association having decided that, in view of the great stress of business, the association give up its usual spring convention with its regular program, there will be held in its place a conference of members who may attend the National Metal Trades Convention in New York, April 27 and 28. This conference will be on the day following, namely, Saturday, April 29, at Hotel Astor. It will be absolutely informal without any fixed program, but open only to members that they may discuss freely the many perplexing problems they are facing.

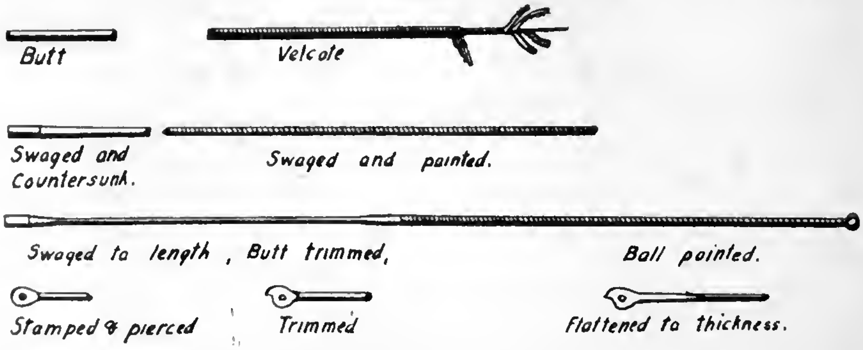


FIG. 12. DETAILS OF VELCOTE TEMPLES.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

REPAIRING A HOISTING ENGINE DRUM

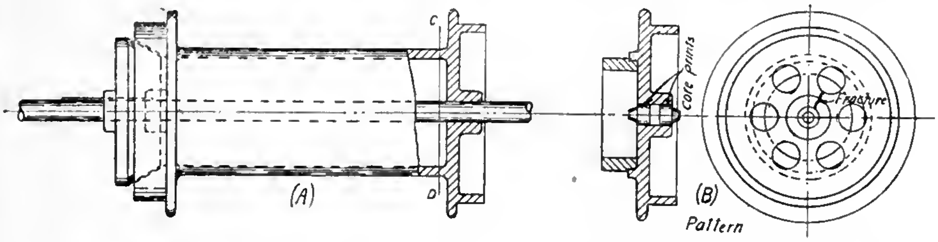
By H. C. F.

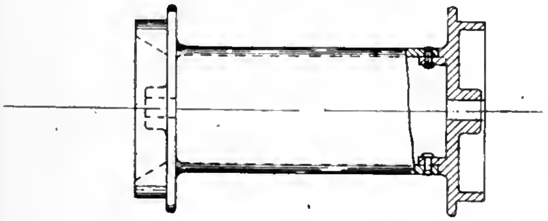
THE class of work with which repair shops have to contend is of such a nature that ingenious methods must be devised in order that a particular job may be finished as quickly as possible, with at the same time attainment of the best possible results, an example of how a small shop successfully dealt with a seemingly hard job is indicated as follows:

During the unloading of a hoisting engine at a railroad construction camp, it was found that one of the hubs of the drum had become somewhat seriously cracked. To shrink a band on the hub would have proved impracticable since the drum had to be free to revolve on the shaft, and such a procedure would have the tendency to bind it tight, so it was finally sent to the machine shop with orders to put it in first-class working condition in the shortest space of time possible.

The job was first placed in a large lathe, being chucked by the sound hub, and supported by a large pipe centre in the tailstock. A cutting-off tool was then inserted and the entire end cut off close to the flange as shown by the line CD, upper sketch A. The end thus cut off was made into a pattern by providing it with a heaving ring and core prints as shown in sketch B.

When this was cast, the brake flange was machined to the correct size, and the ring turned down to make a snug fit for the end of the drum. The latter had been previously set up on the lathe carriage, and the end roughly bored, so as to insure a good fit for the end piece when driven on. A series of countersunk rivet holes was next drilled around the diameter of the drum, and the end piece riveted with ⅝ in. boiler rivets, as shown by lower figure. These were hammered in hot, the head being held from the inside with a suitable holder on.





HOISTING ENGINE DRUM REPAIR.

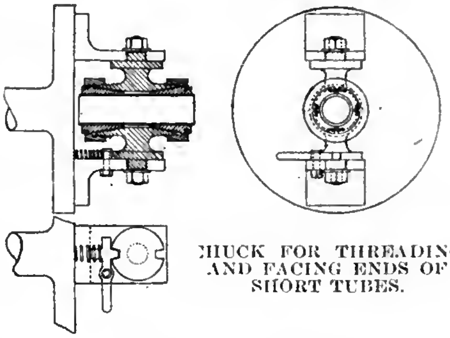
To complete the job, it was only necessary to bore the end piece to fit the shaft. This was accomplished by again setting the work up on the lathe carriage and boring by means of a long boring bar. In other words, the lathe was made to take the place of a horizontal boring machine. Considerable care was necessary, in lining up the work in order to ensure that both holes would be in direct line, as otherwise an unusual amount of trouble would be met with in placing the shaft in position.

Upon completion of this operation, the drum and shaft were assembled and sent back to the camp. The time required to complete the job was about a day and a half, and as for the job being satisfactory—well, the engine ran continuously for nearly eight months, and when laid up for winter, the drum was still in first-class condition.

CHUCK FOR THREADING AND FACING ENDS OF SHORT TUBES

By Billy Dixon

THIS chuck is secured to two angle plates bolted to the lathe face plate. The holes in the two angle plates should be bored together, and the spigots of the chuck made a nice neat fit with no shake. The tube is inserted and gripped by the collets at each end. When the tube is extracted the collet sections are prevented from falling by the four small springs. After one end of the tube has been bored, faced and threaded, the nuts securing the chuck to the angle plates are loosened, the catch is released, and the 1.60 chuck swung round for machining of the second end; thus ensuring the two ends being true with each other and the faces parallel.



CHUCK FOR THREADING AND FACING ENDS OF SHORT TUBES.

GAUGES IN MODERN MANUFACTURING PRACTICE—I.

By F. H. Mayoh.

THE magnitude of the problems involved in interchangeable manufacture has increased to an extent which most mechanics recognize, none more so than tool designers upon whom devolve the necessity of providing a successful system of gauging suitable for every combination of tools met with in modern practice.

To get an idea of the numerous types of gauges in use, one may select some of them from a list of manufacturers' standard types, such as plug, ring, snap, transfer, disc, depth, thread, etc., and then add the large number of special gear, length and form gauges to numerous set blocks that are

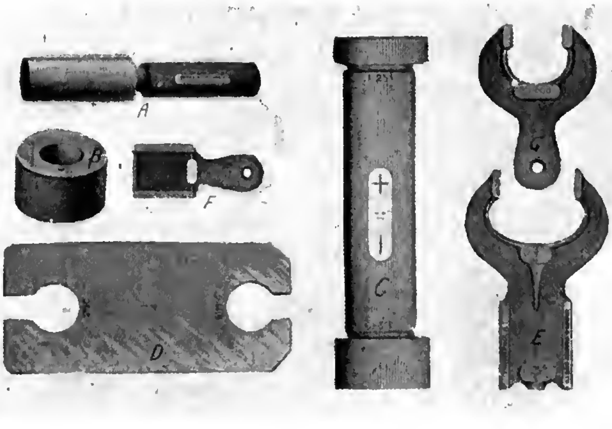


FIG. 1. (a)—PLUG GAUGE; (b)—RING GAUGE; (c)—PLUG LIMIT GAUGE; (d)—INTERNAL LIMIT GAUGE; (e)—DOUBLE-END CALIPER GAUGE; (f)—INTERNAL CALIPER GAUGE; (g)—EXTERNAL CALIPER GAUGE.

in use for locating cutters, etc., in place, and we begin to understand that gauges are more than an after consideration.

Standard Gauges

For completeness, it has been deemed best to illustrate in groups a number of standard gauges, and referring to Fig. 1, we have a plug gauge A and a ring gauge B which are for standard internal and external measurements; a plug limit gauge C and an external limit gauge D, which go on at one end and fail to go on at the other end and which are often marked with readily distinguished signs to help in preventing errors. Standard caliper gauges E of the double-end type are also shown in Fig. 1, and these are also made in the single-end type F and G. Referring to Fig. 2, standard types of depth gauges are shown, one of which, A, is provided with a scale. B is for use with various lengths of wire, and is of the spring type with a spiral spring in the barrel, which forces the blade against the bottom of a hole. A vernier depth gauge is illustrated at C and a micrometer depth gauge at D, the reading of these tools being taken in the usual manner, as provided for micrometers and verniers.

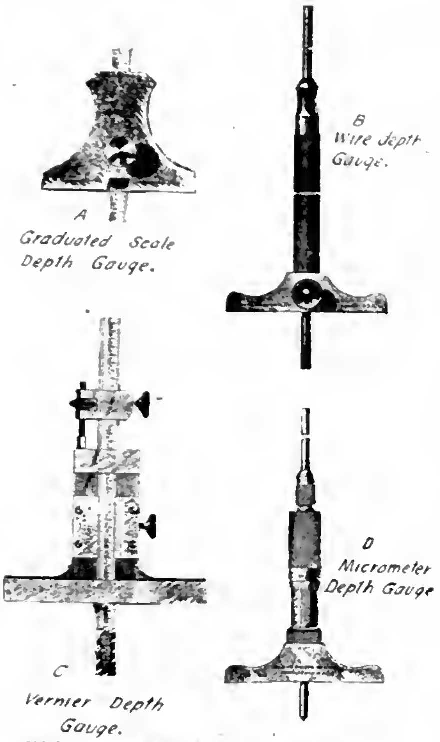


FIG. 2. VARIOUS TYPES OF DEPTH GAUGES.

A feeler gauge A, a thread gauge B, a centre gauge C, and a wire gauge D are shown in Fig. 3, while a surface gauge A, a drill gauge B, and a test indicator C, Fig. 4, serve to illustrate the general run of these tools. Besides these, there are sheet metal gauges, end measuring rods, reference discs, which are used for testing gauges and micrometers of various styles, inside, outside, thread and lengths, verniers, height gauges, bevel protractors, and numerous others, which one meets with in machine shop practice.

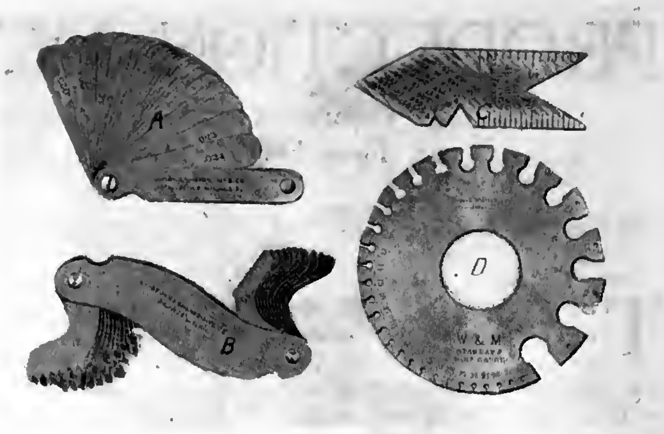


FIG. 3. (a)—FEELER OR THICKNESS GAUGE; (b)—THREAD GAUGE; (c)—CENTRE GAUGE; (d)—WIRE GAUGE.

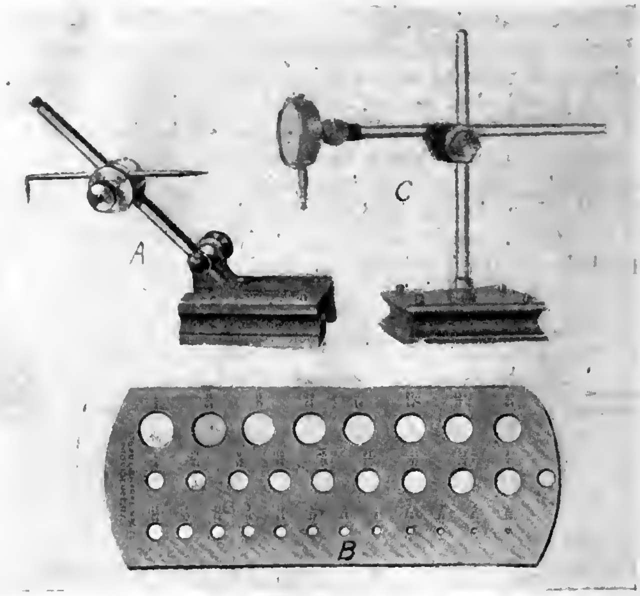


FIG. 4. (a)—SURFACE GAUGE; (b)—DRILL GAUGE; (c)—SURFACE TEST INDICATOR GAUGE.

DECIMAL AND METRICAL EQUIVALENTS OF FRACTIONS OF AN INCH.

Fractions of an inch.	Decimal equivalents of an inch	Equivalents in millimetres.	Fractions of an Inch.	Decimal equivalents of an inch.	Equivalents in millimetres.	Fractions of an inch	Decimal equivalents of an inch.	Equivalents in millimetres.
1-64	.015625	.397	11-32	.34375	8.731	43-64	.67187	17.065
1-32	.03125	.794	23-64	.35937	9.128	11-16	.6875	17.462
3-64	.046875	1.19	3-8	.375	9.525	45-64	.70312	17.859
1-16	.0625	1.587	25-64	.39062	9.922	23-32	.71875	18.256
5-64	.078125	1.984	13-32	.40625	10.319	47-64	.73437	18.653
3-32	.09375	2.381	27-64	.42187	10.715	3-4	.75	19.05
7-64	.109375	2.778	7-16	.4375	11.112	49-64	.76562	19.447
1-8	.125	3.175	29-64	.45312	11.509	25-32	.78125	19.843
9-64	.140625	3.572	15-32	.46875	11.906	51-64	.79687	20.24
5-32	.15625	3.969	31-64	.48437	12.303	12-16	.8125	20.637
11-64	.17187	4.365	1-2	.5	12.7	53-64	.82812	21.034
3-16	.1875	4.762	33-64	.51562	13.097	27-32	.84375	21.431
13-64	.20312	5.159	17-32	.53125	13.494	55-64	.85937	21.828
7-32	.21875	5.556	35-64	.54687	13.89	7-8	.875	22.225
15-64	.23437	5.953	9-16	.5625	14.287	57-64	.89062	22.622
1-4	.25	6.35	37-64	.57812	14.684	29-32	.90625	23.018
17-64	.26562	6.747	19-32	.59375	15.081	59-64	.92187	23.415
9-32	.28125	7.141	39-64	.60937	15.478	15-16	.9375	23.812
19-64	.29687	7.54	5-8	.625	15.875	61-64	.95312	24.209
5-16	.3125	7.937	41-64	.64062	16.272	31-32	.96875	24.606
21-64	.32812	8.334	21-32	.65625	16.668	63-64	.98437	25.003
						1	1.0	25.4

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

THE MAKING OF BETTER MECHANICS

By H. C. F.

ONE frequently hears the question asked as to which mechanic receives the better training—the one who learns his trade in the small, repair shop, or the one who began, by looking for the "left hand monkey wrench" in a large specialised manufacturing concern. The fact is evident that the class of work for which these respective shops are adapted is of a widely diversified nature, and methods of obtaining results as practised in one shop would be almost if not quite unknown in the other.

The majority of mechanics are inclined to give the smaller shop due credit for the class of mechanics it has turned out. Its work is by no means specialized and as a result its mechanics are not specialists on any one particular class of work but are expert on many.

Small Shop Conditions

The apprentice in a small shop is not started off by working for six months on a drill press, the next six months on a shaper, and so on, as is the usual procedure in a large shop, but instead he gets such a start that, by the end of the first six months he is able to take care of a considerable range of the work. The class of work demands this. Furthermore the apprentice is left more or less to his own ability. He learns to a great extent by experience and experience is at all times the best teacher. The foreman cannot be constantly watching the apprentice for he is nearly always busy on some other work, probably an "out job" so the result is that the boy "finds out" for himself, and information gained in such a manner is not easily forgotten.

Variety of Work

Then there is the class of work which the small shop man comes in touch with. To say, that he never knows what his next job will be is stating a real fact of the case as a result of which he has to be proficient enough to handle every job as it comes,—and handle it in the right way. One of the most important features of his work is the necessity for a sufficient knowledge of prime movers that will enable him to handle engine repairs quickly and efficiently. A knowledge of the steam engine, both stationary and portable, including threshing engines and tractors, is one of the essential requirements. He must be in a position to make repairs under adverse conditions and without the advantage of having the shops right at hand. It is then that the inventive qualities of the men are brought to bear upon the work.

A thorough understanding of a boiler is also necessary, more especially on the portable or traction engine boilers. The men in charge of these boilers are more or less inexperienced or careless in their work and burned crown sheets, leaky tubes, and stay bolts are frequent occurrences.

Repairs a Specialty

Patching a burned or cracked crown-sheet requires a certain amount of skill and a larger amount of perseverance. The use of oxy-acetylene welding is remedying conditions to a certain extent, its use being specially adapted to this class of work, but such an outfit is not at all times to be found, so the mechanic must rely on his quality of perseverance. He must possess it to win out.

A knowledge of electricity is also a necessity in order that the mechanic will be in a position to handle repairs which mighe be found necessary, in a power plant or sub-station. Then too, as a direct connection with electrical experience a knowledge of water power machinery, i.e. water wheels and turbines, is also essential and the rudiments of these are learned chiefly through practical experience.

Other Branches Necessary

Furthermore, the mechanic in the small shop is not necessarily a mere machine hand. He, as a rule, has other trades thrown in, each of course, bearing, more or less on the machine trade. He acquires a certain understanding of pattern making. He may not be an expert pattern-maker but nevertheless he becomes sufficiently acquainted with woodworking tools so that he is enabled to get out a more or less complex pattern and in a comparatively short space of time. His ability as a pattern maker does not alone make him a more adapt mechanic but he also becomes acquainted with a rudimentary foundry knowledge. Core-making and moulding with a knowledge of melting are all included in the learning of the machinist trade.

Also there is the work included in the blacksmith shop which is even more loosely connected with the machine trade. He often becomes equally proficient in this trade as well as his own, but, however, the essential part of it to the machinist, is the fact that it enables him to forge and dress his own tools.

The machinist then who learns his trade in the small shop, acquires not only the mere ability of being able to "run" every class of machine tool, and a practical insight into other trades directly connected with his own but he also learns to exercise his inventive

SECTION OF SMALL SHELL HYDRAULIC PRESS SHOP IN NEW BRITISH PROJECTILE-MAKING FACTORY.

abilities coupled with the usual quality of perseverance.

Aspect of the Large Shop

To look at the other side of the question we find a somewhat different state of affairs. In the large shop the apprentice in the majority of cases is kept on one machine for a period covering six to ten months. The result is that he becomes careless. He gets into a rut. He has a certain amount of work to do, he must do it in a certain way—the way the fellow before him used to do. The foreman gives him the job, he gets the jig, the machine runs along in the same old way and the boy becomes as the machine. He gets into the old routine "pick up, chuck up, cut up, let up". He loses all interest in work—his chief thoughts are centered on the whistle and on pay day. He doesn't feel inclined to exercise his brain power to an extent that will enable the work he is doing to be accomplished in a more acceptable way and should he devise some other means of doing such, he is not inclined to voice his opinion to the foreman. He thinks the man higher-up will give him the laugh.

Expert Machine Runners

After he has finished his four or five years apprenticeship, what, really, has he learned? True he might be a specialist on cutting gears or running a boring mill and while being admittedly proficient in running a machine he is sadly deficient in possessing a real understanding of the business. Foundry work, pattern work or smithing is practically unknown to him. He never has learned how to dress his own tools—that is the toolsmith's job—the result is in many cases that they are forged just the opposite way to his requirements. However he has to take the chance of getting them done right. He can't do them himself for the simple reason that he doesn't know the difference between a "fuller" or a "hardy."

Limited Opportunities

It is the same with regard to foundry work for he is at a loss to know even why the castings he is machining are full of blow-holes. It is true there are many—a great many energetic young machinists who will put themselves out to unearth the "why" and "wherefore" of these connecting trades, but the majority of their knowledge must be derived from books rather than from actual experience.

The so-called machinists then that are being turned out to-day by our large shops are really taking upon themselves a wrong name. They are merely operators or better still specialists. Their knowledge of the vast machine trade is limited to the one machine which they become proficient in operating. The real machinists are to-day very much in the minority. The shops that turn out men learned in every branch of the trade are gradually decreasing, and while they will not altogether disappear, the number of workers trained by them are an ever lessening proportion of our industrial army.

So long as specialization pays, and that would seem to be always, so long will the all-round mechanic of tried ability become scarcer, simply because the conditions necessary for his development no longer exist.

WHO'S WHO?

WILLIAM CASEY, recently appointed manager of the Canadian Locomotive Co., Kingston, Ont., was born in the latter city on October 13, 1887. He was educated at St. Mary's School and Regiopolis College, and entered the employ of the above company as office boy. Following this he served an apprenticeship in the machine shop, being transfered thereafter to the drawing office. In 1907 Mr. Casey was appointed machine shop foreman which position he held until 1912, when he returned to the office to take charge of piece work and estimating. In 1914 he was made assistant to the vice-president and general manager (A. W. Wheatley), and following the latter's resignation a few weeks ago, Mr. Casey received the appointment of manager of the Canadian Locomotive Company.

WILLIAM CASEY,
Manager, Canadian Locomotive Co., Kingston, Ont.

CONCERNING PREMONITIONS

By Woodworker

"I THOUGHT it would break, and it did." The above "wise saying" is heard much too often. It should not be heard at all, for whenever it is feared that something is going to snap, it should be thoroughly investigated, so that one's mind may again be at ease. If the design or construction is wrong, it should be made right. If your investigation proves that everything is O.K., very well, your premonition will vanish.

For some reason or other, an engineer friend of mine worried constantly about the belt that drove his exciter. He feared it would break any minute because it often slipped off the pulley on starting. He looked it over carefully every day. He kept the lacing in tip-top shape. He did everything, almost, except to investigate the matter. The belt was three times stronger than necessary and was amply safe. The exciter pulley was simply too small and the trouble was easily remedied. After the belt stopped slipping off, my friend had no more premonitions. However, had it broken before the investigation he doubtless would have said, "I thought it would break, and it did."

I can think of no case where a man who is entrusted to care for a plant could utter these words in a careless care-free manner, especially if the break is of a serious nature.

LABOR AND MACHINERY

THERE is nothing more pathetic in industrial history, says Engineering, than the conflict of labor with machinery. It has existed for a hundred years or more, during which time there has been a constant progress in comfort and well-being among the working classes. Yet even to-day the machine is looked upon with suspicion by the workman as something designed to filch his living from him. Curiously it is only the novel machine that is the subject of hostility.

If men were asked to do the old heavy work with chisel and file that obtained fifty years ago, they would indignantly refuse and ask why there were not planing machines and shapers to do the job. They do not object to a condition of affairs which has become established, and has lightened their toil, but an appliance that threatens even temporarily to produce a greater output fills them with apprehension.

All the efforts of the economists seem to have failed to spread clearer ideas on this subject; but until more accurate views prevail, it is difficult to see how the amelioration of the lives of the working classes is to be achieved. As a general proposition, a man gets about what he has earned in whatever class he is, and the way to get higher pay is to produce more.

CONTEMPORARY WAR ARTICLES

Embracing Information and Data Drawn from a Variety of Sources Relative to and Arising from the Prosecution of this Many-Sided European War

SHELL MAKING TOOLS

An important detail in the manufacture of shells is that of the chucks to be used for the various operations, and the following account of those made by J. & H. McLaren, Ltd., of Leeds, and taken from The Engineer, should be of more or less interest to Canadian shell manufacturers.

The chief features of these chucks are simplicity, rigidity and accuracy of finish. Fig. 1 represents two sectional views of one of the chucks, which comprises a central body A with flange B for securing to the adapter flange on the lathe spindle, an external nut C, and collet rings D, and three hardened steel jaws E, which fit in corresponding slots in the body. The jaws are prevented from falling out by means of screws and spiral spring buffers F, which are inserted through the body at right angles, the blind holes in the jaws into which they engage being shaped so as to allow of just sufficient movement of the jaws to enable the shell to clear. The nut C is provided with a right-hand

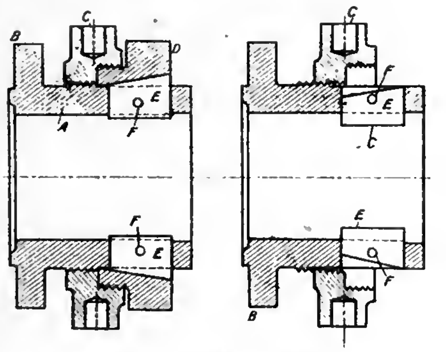


FIG. 1. COLLET CHUCK.

V thread for screwing on to the sleeve and a left-hand thread to receive the collet ring. The endwise movement of the conical collet on the taper jaws causes the latter to engage with the shell the movement being produced by the right and left-hand threads when the nut C is turned. The jaws are made of tool steel hardened and ground in place within limits of two thousandth of an inch.

Fig. 2 represents a sectional view of an expanding shell mandrel, in which B are the hardened steel jaws, held in position by spring buffers A, the jaws gripping the shell body by the endwise movement of the plug D, which is brought about by the screwed nut on the shaft G. The movement of the plug is limited by the washer C and ferrule E. For turning the copper bands on the shell bodies an adapter centre is provided, being shown in Fig. 3. Before

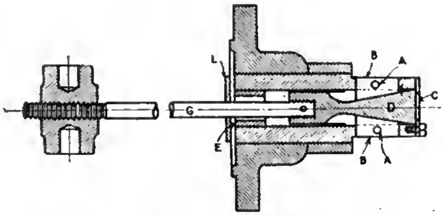


FIG. 2. EXPANDING MANDREL.

the shell reaches this stage it has been equipped with a base plug, and the original centre at that end has been removed. It is, therefore, necessary to adapt a centre to run quite true with the finished shell, and it is important that this device be firmly secured to the shell and run truly with it during the band-turning operation. It is also necessary to replace the ordinary centre in the loose headstock by the new centre shown.

The body of the adapter B is made a running fit on the centre, and is provided with a hardened piece C for the centre to bear against. This piece is screwed into the body by a left-hand thread. The body, is also coned to receive the spring collet D, which is bored out to take the end of the shell and turned outside to fit the cone in B. It is fitted with three studs E, which pass through the body, each having a small spring F, nut G and split pin.

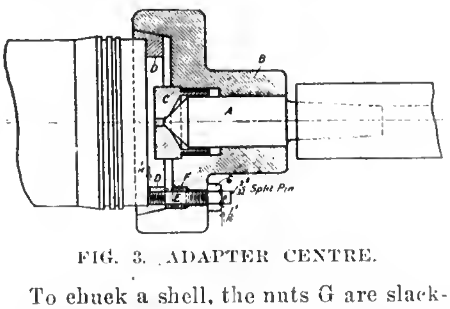


FIG. 3. ADAPTER CENTRE.

To chuck a shell, the nuts G are slacked back to the split pins, allowing the springs F to force the collet ring out of the cone and open to receive the shell base. When the latter has been inserted the loose headstock spindle is screwed up until the shell is held lightly in the centres. The lathe is then started, and, while running the further tightening up of the loose headstock spindle goes on until the shell finds its own centre. The lathe is then stopped and the loose spindle further tightened up until the shell is firmly gripped by the spring collet D. The three nuts G are then tightened up by finger and thumb only to retain the grip of the collet, and the loose headstock spindle is slacked off to a proper running fit.

Fig. 4 represents the equipment for forming the waves for the copper bands on shells on ordinary lathes. The shell on which the operation is to take place is held by an internal chuck at the nose end, while at the other end revolves in the lathe centre. A case-hardened roller path A is bolted to the chuck, and the hardened roller B is kept in contact with the path A by two powerful springs D D', which allow the lathe saddle to move freely endwise, while ensur-

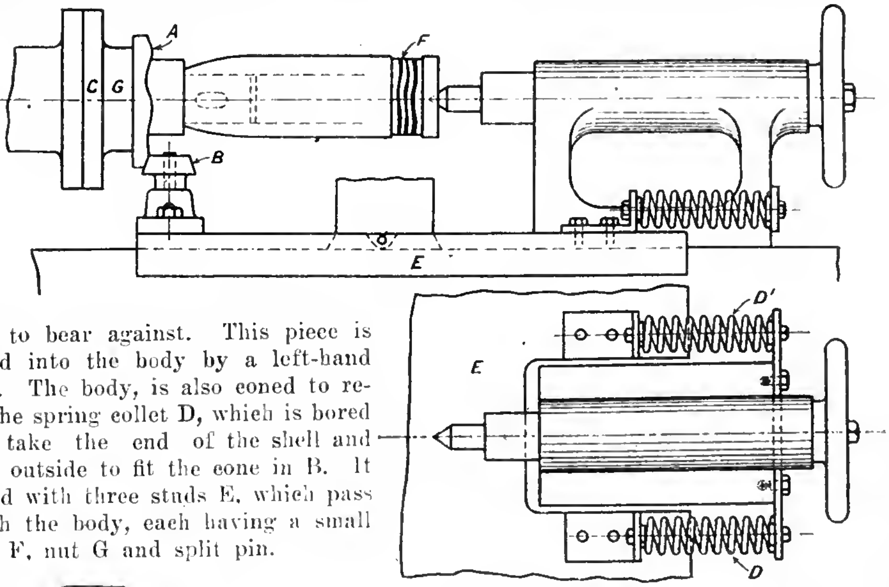


FIG. 4. COPPER BAND GROOVE WAVING ARRANGEMENT.

ing that the roller B follows the undulations of A when the tool is cutting.

For forming the internal radii of 4.5 in. high-explosive howitzer shells a special blending tool has been devised—views of which are given in Fig. 5 and 6. It is an extremely simple device, comprising a rigid bar or tool holder A B, in which is inserted the shaped cutter. This is securely held by means of pinching screws D D', E E'. The cutter

is set by resting a straight edge against the hardened and ground head A and the shoulder B. The end of the cutter next A is set to touch the straight edge, while the other end stands just

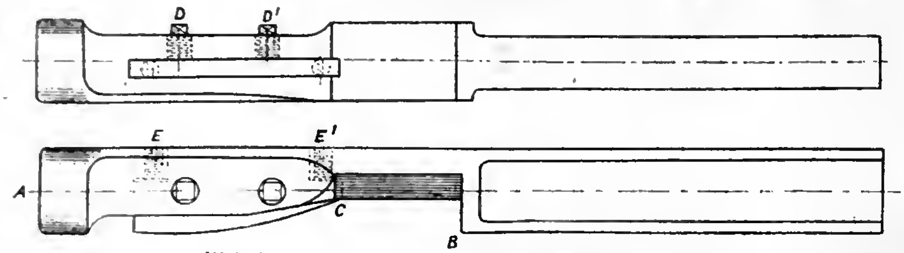


FIG. 5. BORING TOOL FOR INTERNAL RADII.

"proud" of the neck C. In setting the tool in the lathe it is essential that the head A and shoulder B should pass freely through the hole in the nose of the shell, giving a clearance all round.

After adjustment, the tool is inserted into the shell until the shoulder B just clears the outside of the nose. Then with the cross traverse the tool is moved sideways until the hardened head A just comes in contact with the shell wall. The tool is then traversed outwards and the material is cut away until the shell is sufficiently blended. To ensure absolute uniformity in blending, a gauge is necessary between the shoulder B and the nose of the shell.

In many works difficulty has been met with in the production of suitable dies to bottle the heavy thick-walled high-explosive shell. Fig. 7 represents the usual type of bottling dies, the bottom part being of steel and the top half, which closes in the heated nose of the shell, of close-grained cast iron. On shells of medium thickness, the dies

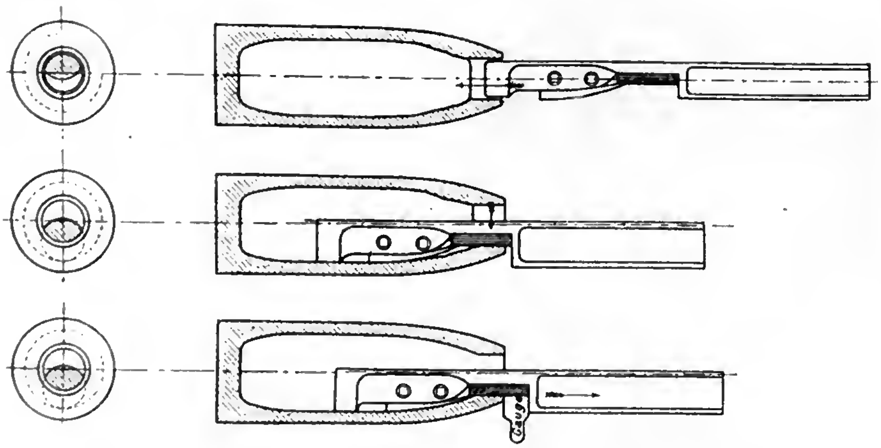


FIG. 6. APPLICATION OF BORING TOOL FOR INTERNAL RADII.

last fairly well, but with the thicker walled shells the wear on the die is very appreciable, the inside becoming gouged out, as shown by the dotted lines at A; the die is consequently spoiled.

To obviate this trouble some makers line the top die with chilled cast iron bushes, which prevent the wear due to the gouging action, but the chilled bushes frequently break owing to the cooling by water between the "heats." The spigot B has also been known to break off before the lining was worn out. To overcome these trobules, the spigot B has been abandoned and the dies made as shown in Fig. 8. The strengthening hoop D has been lowered so as to encircle the bottom die and serves instead of the spigot. The chilled

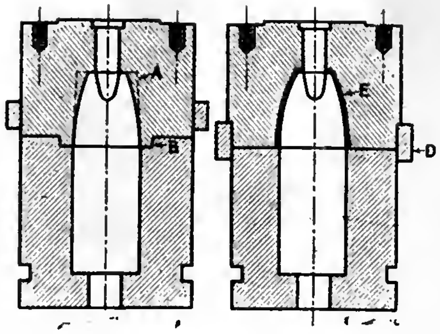


FIG. 7. FIG. 8.

conical hole E in the top die is made with ample metal around it to prevent water cracks, and the face is thoroughly chilled to a good depth.

THRIFT AND PRODUCTION CAMPAIGN

THE Dominion Government is starting an extensive campaign for the promotion of thrift and production in Canada. The principle of saving and thrift for the individual male and female is to be inculcated through a series of newspaper articles published throughout Canada with a view to putting the nation as a whole in a better position to bear the stress of war and to furnish the sinews of war for the cause of the Allies. The principle of production of new wealth from the land is to be similarly inculated, along the lines adopted last year, which tended to produce the record crops and which has enabled Canada to do more than ever before towards furnishing food supplies for export for the benefit of the Allies. A considerable sum of money has been voted by the Cabinet for the advance campaign which is to be conducted under the joint auspices of the Agricultural and Finance Departments.

The advertisements will be placed with newspapers throughout Canada, starting at once, through the King's Printer, who will furnish to each newspaper the necessary material. The same system will be adopted as was adopted in advancing the domestic loan of last autumn. The Government's statement in announcing the campaign is that there will be no distinction of polities made in placing advertisements.

WOMEN IN OXY-ACETYLENE WELDING

OXY-ACETYLENE welding is the latest work to attract female labor in England, an industry itself in its early stages. The success in the introduction of women into British industries and vocations calling for much skill has been remarkable in the last eighteen months, remarks an English paper, and every day seems to bring a fresh surprise in this direction. Ever since the active service branch of the National Union of Women's Suffrage Societies was formed, it has kept to the fore a programme of practical effort, and last September the first school for teaching of welding to women was opened. Six weeks' training is usually enough to equip a girl to take her place in a plant. Even before the war there was not an abundance of men doing this work, for the temptation with them when they had attained proficiency was to go to the still better paid work of cutting metal with oxygen.

G. G. Bramhill, district representative of the Ontario Department of Agriculture in Lambton County, has been appointed flax expert in the Federal Department of Agriculture. Mr. Bramhill will familiarize himself with the whole flax question in Canada, carry on investigation work in connection with fibre production, fibre manipulation and grading, and with the utilization of the straw where flax is grown for the grain, as in Western Canada.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

COMBINATION FILING MACHINE AND HACKSAW

THE Simplex Combination Bench Filer and Metal Hacksaw is a machine designed to take the place of hand filing and drill work, such as is required in making dies and similar work. The machine somewhat resembles the bench type of sensitive drill, the spindle and its driving gear being replaced by a vertical ram which is reciprocated by an oscillating arm driven by an adjustable crank disc.

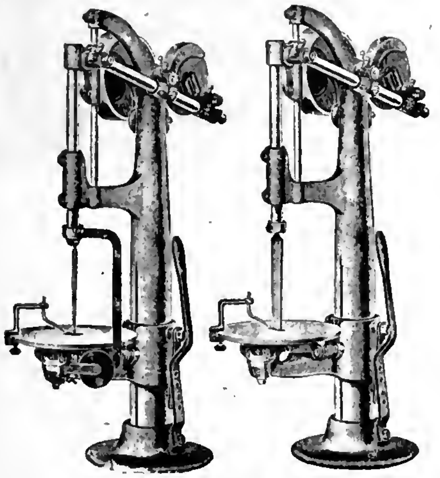


FIG. 1.—MACHINE ARRANGED AS HACK SAW AND FILER

Two views of the machine are shown in Fig. 1., as a metal hacksaw, and as a filing machine. The saw or file is driven rapidly with a vertical movement, the cut being on the down stroke so that no burr is turned over the line thus enabling the operator to file right up to the line without obscuring it. The filings are also discharged below the work where there is no mechanism to be damaged; all bearings are above the file where it is impossible for filings to get into them and cause wear.

The table is rapidly raised and lowered by the hand lever at the side, adjusting holes in the lever allowing the working height to be altered to suit the

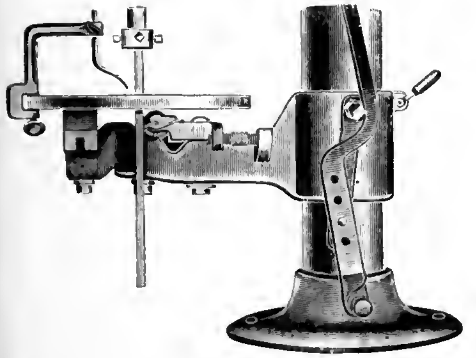


FIG. 2.—TABLE ELEVATED TO WORKING POSITION

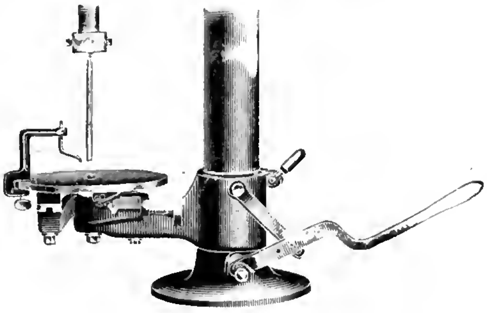


FIG. 3.—TABLE LOWERED FOR REMOVING WORK

condition of the file surface. Fig. 2 shows the table in working position, the side thrust being taken by a soft steel guide roller back of the file, while the bracket clamped to the edge of the table carries an adjustable hold-down. Fig. 3 shows the table lowered enabling the operator to remove or replace work without changing the position of file, hold-down, or guide roller.

The machine is fitted with a hack-saw frame taking 9 in. blades, which can be attached to the ram in a few seconds. This attachment is very desirable for cutting out model and die work, being particularly adapted for turning sharp curves. A sample of this work is shown in Fig. 4, the time required for the sawn hole being 18 minutes against 50 minutes for the drilled hole.

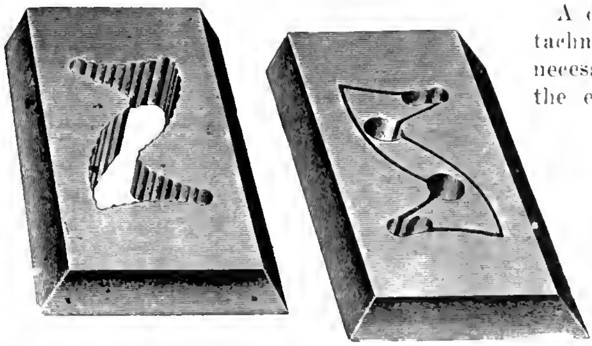


FIG. 4.—SHOWING DIFFERENCE IN WORK DUE TO USE OF SAWING ATTACHMENT FOR DIE MAKING.

Graduated plates enable the table to be tilted in either direction to any desired angle up to 20 degrees forward, 15 degrees either side, and 10 degrees back. The table is 10 in. diameter, and stroke is adjustable from 0 in. up to 6 in.

The builders of this machine are the Extensive Mfg. Co., New York, N.Y., who supply it with complete equipment including countershaft, belt shifter, wrenches and various attachments.

DIRECT READING PLATFORM INDICATOR

TO eliminate the handling of various weights ordinarily experienced in the weighing of large quantities of material, and at the same time increase the accuracy of results, the Canadian Fairbanks-Morse Co., have placed upon the market a direct reading Dial Indicator, which can be readily applied to any existing platform scale.

DIAL INDICATOR APPLICATION TO PLATFORM SCALE.

A distinctive feature of this attachment is the absence of any necessity for calculation to obtain the exact reading. The correct weight is automatically indicated on the dial, the instant the load is placed upon the platform. An internal view of the indicator is here shown, illustrating the general construction of the operating mechanism. The device is built along the lines of the ordinary beam scale, the beam being inside the case. Attached to this beam by means of lugs extending through slots in the case, is a graduated bar with poise (used only for taking tare of trucks or other containers). It offers also the further advantage of allowing hand weighing up to the full capacity of the dial, but is entirely independent of the dial. This construction thus permits of two accurate and independent systems of weighing.

The principle of the inclination balance is employed to furnish the resistance necessary to counterbalance loads up to the initial capacity of the dial, the main pendulum (E) being accurately sealed to the beam. In addition, the compensating pendulum (F) provides a further safeguard against change of balance due to scale being out of level or indicator out of plumb.

Vibration of the indicator is effectively prevented by an oil shock absorber with aluminum plunger attached to the end of the beam. Ample clearance is allowed to avoid undue friction.

Each indicator is fitted with a slotted shelf lever to transmit the load from the lever system to the dial, by means of which the dial is easily adapted to different types of scales.

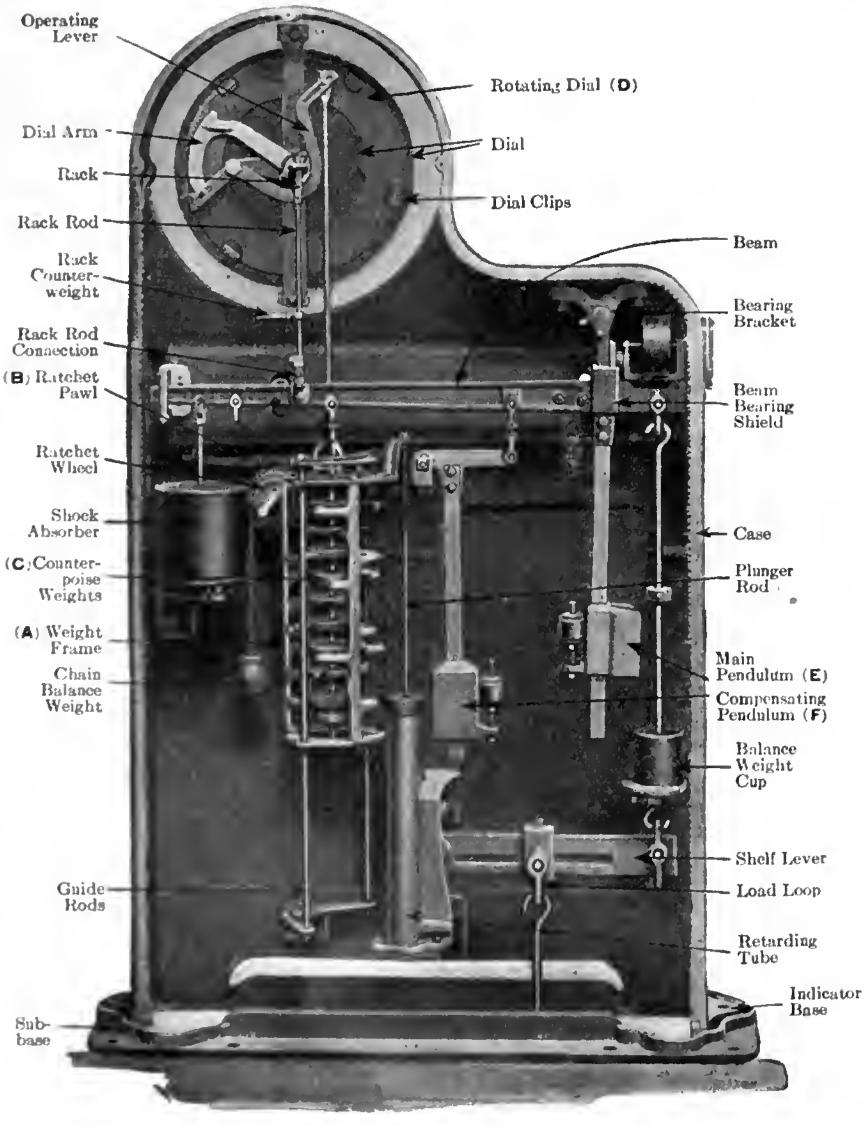
The iron case containing the dial parts is of exceptional heavy and rigid construction, to ensure permanent correct relation of the dial mechanism to the scale levers.

The base of the case has convenient leveling screws at the front. This base rests upon a separate outer iron base, the latter being securely bolted to the foundation, the entire setting thus providing simple means for proper alignment.

Supplementing the graduated dial is the weight frame (A), and counterpoise, carrying nine weights, each of which has the same value as the initial dial capacity, so that the total capacity of the indicator is ten times the capacity of the primary dial.

When the load is placed on the platform the shelf lever is depressed, thus raising the beam and also the rack rod which operates the pinion secured to the indicator hand. If the weight exceeds the registration on the initial dial and the hand travels beyond the final graduation, a button at the front of the stand, attached to the ratchet pawl (B), is pressed down, releasing the ratchet wheel, and allowing the weight frame (A) to lower, thus depositing weights at intervals until the indicating hand returns to the graduated section of the dial. As each weight is deposited on the counter-poise, the rotating dial is revolved and corresponding figures are shown through openings in the primary dial. By this means the correct reading is automatically recorded for all weights within the capacity of the machine.

FRONT VIEW OF DIAL INDICATOR.



DIAL INDICATOR INTERIOR SHOWING CONSTRUCTIONAL DETAIL.

These dial indicators are made in two sizes, one with a maximum capacity of 2,000 lbs., and the other with a capacity of 10,000 lbs. However, owing to the unique method of obtaining full capacity on the dial, the scale can readily be made of any required capacity.

WILL MAKE TOYS IN CANADA

THE Toy Buyers' Association was formed at a meeting of toy manufacturers and toy buyers at the Toy Exhibition in the Royal Bank building, Toronto, on March 30. The following committee was appointed: P. H. O'Neil, of the T. Eaton Co., Toronto, president; J. A. Wade, of the Consolidated Rubber Co., Montreal, vice-president; John A. Chantler of John A. Chantler & Co., second vice-president; L. G. Beebe, secretary-treasurer; L. V. Dusseau, of Gendron Manufacturing Co., Toronto; L. C. Fortin Duchesneau & Duchesneau, Montreal; Arthur P. Reed, of the Copp Clark Co., Toronto; W. G. Botsworth, of the United Incandescent Light Co., Toronto; Mr. M. E. Cone, of the Dominion Toy Co., Toronto. The design of a maple leaf with "Made-in-Canada" stamped in the centre has been selected.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager
PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.
PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.
H. C. FOGARTY.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. APRIL 6, 1916 No. 14

EXPORT TRADE DEVELOPMENT

AN interesting feature relative to the development of American export trade, and incidentally that of the home market is the appeal by the United States Bureau of Foreign and Domestic Commerce for young, high-grade men whose education and natural ability fit them for service abroad. It is realized that nothing will contribute so effectively to the efficiency of the Bureau in the matter of aiding manufacturers to establish new connections and make those already formed more progressively valuable, than through the above indicated medium. As showing the urgency with which the immediate situation is viewed, and the highly sanguine achievement expectations formed of the scheme, it is desired that young men in large numbers present themselves at the Civil Service Examinations on April 5, the purposes of which are the selection of clerks for service with Commercial Attaches in foreign countries, and for service in the Bureau of Foreign and Domestic Commerce at home. The knowledge of one or more foreign languages is made an essential, and the salaries for appointments abroad are stated as being $1,500 per annum.

Canada, as well as the United States, is interested in establishing and building up an export trade. Her Attaches abroad—Trade Commissioners, are for the most part, however, located in Great Britain or in Colonies of the Empire, but the time has arrived when she too must "lengthen her cords and strengthen her stakes" by taking action along lines very similar to those of our Southern neighbors. Something more than the administrative and business activities of our Department of Trade and Commerce are called for at this juncture, and either in co-operation therewith or on their own initiative should our Canadian manufacturers in a corporate capacity take the requisite step. The scheme launched by the United States Bureau of Foreign and Domestic Commerce is worth appropriating.

LAKE MARINER SHORTAGE

IN the realm of shipping as in those of the farm and the workshop, labor scarcity is causing considerable anxiety. Canadian marine interests find the situation meantime so acute, that to protect themselves in the matter of the coming season's business on our Great Lakes, a recruiting office for mariners must needs be established in Toronto at least. Bottoms are of course much less plentiful than in pre-war years, due to so many lake craft having been transferred to ocean and ocean coasting services, nevertheless, it appears that crews are still less plentiful, due to enlistments for overseas service in one or other of the many battalions organized or in process.

Prospects for season 1916 are particularly bright for lake freight transportation, and as many contracts have already been negotiated, it is but reasonable to infer that a shortage in crew complement will not only prove a serious handicap in taking full advantage of the season's activities, but is likely to involve shipowners in losses more or less large. As we understand the situation, the shortage is largely that of sailors, the deck officers and engineers being for the most part again available. Sailors have their place of relative importance on every ship, and a considerable degree of competence in the discharge of their multifarious duties is required, on which latter account we can readily appreciate the vessel owners' present anxiety.

NATIONAL FAIRS AND NATIONAL BUSINESS

THE Second British Industries Fair was held from Feb. 21 to Mar. 3 in the Victoria and Albert Museum, London, Eng. In drawing the attention of Canadian firms to this event, emphasis is laid on the object of these Fairs which are to be of annual occurrence and destined to be of great assistance in furthering British trade interests.

The object is to bring manufacturers into contact with buyers for the home and overseas markets, and thus assist the former to capture the trade in certain products previously supplied by Germany. The first Fair which was held a year ago was organized by the British Board of Trade, and the results were so satisfactory that the exhibitors urged that body to assume control of future functions.

The importance of such an event will be understood when it is stated that admission was by invitation of the Board of Trade only, and was confined to bona fide buyers for home and overseas markets, this restriction of admission emphasizing the fact that the Fair was organized for business pure and simple.

While we do not wish to appear as advocating anything like an abandonment of amusement at the Canadian National Exhibition, we do wish to point out the desirability of every Canadian manufacturer exhibiting his product more extensively and intensively than ever before. The Exhibition authorities can be relied upon to give the usual publicity to the event, and the Department of Trade and Commerce through their Commissioners should see that foreign buyers are advised of the event in time to include it in their itinerary.

The Canadian Exhibition, however, is broader in its scope than the British Fair referred to, which was confined to toys and games; earthenware, porcelain and china; glass goods; fancy goods; and stationery, etc., and the wider field here only makes it more desirable that every line of industry be represented more strongly than before. The value of the efforts being made by the Department of Trade and Commerce on behalf of our manufacturers could be admirably demonstrated by the establishment of a Bureau at the Exhibition where samples and catalogues at present in Ottawa would be available to interested parties. The opportunity for examining these articles would be welcomed and accepted by numerous parties who otherwise might not be able to make a special journey to Ottawa, and the present awakening of Canadian interest in overseas trade would receive an impetus which will be invaluable during the world-wide competition of the near future.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 45	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron.	28 00	
Ferro nickel pig iron (Soo)	25 00	
	Montreal.	**Toronto.**
Middlesboro, No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	3.00
Steel bars, 2 in. and larger, base	4.00
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	3.00
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	3.00
Small shapes	3.25
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	3.10
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$31 00	$30 50
Electrolytic copper	31 00	30 50
Castings, copper	30 00	30 00
Tin	51 00	54 00
Spelter	23 00	22 00
Lead	10 00	11 00
Antimony	48 00	48 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in.	$3 75	$3 75
Heads	4 00	4 00
Tank plates, 3-16 in.	4 05	4 10

WROUGHT IRON PIPE

Prices in effect March 20, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 25
1/4 and 3/8 in.	2 88	4 95
1/2 in.	3 66	5 65
3/4 in.	4 37	7 07
1 in.	6 46	10 46
1 1/4 in.	8 74	14 15
1 1/2 in	10 45	16 91
2 in.	14 06	22 76
2 1/2 in.	22 23	35 98
3 in.	29 07	47 05
3 1/2 in.	34 96	56 58
4 in.	41 42	67 04

Lapweld

	Black	Galv.
2 in.	15 54	24 24
2 1/2 in.	22 82	36 56
3 in.	29 84	47 81
3 1/2 in.	35 88	57 50
4 in.	42 51	68 13
4 1/2 in.	52 07	83 19
5 in.	60 68	96 94
6 in.	78 72	125 80
7 in.	109 50	167 80
8 in. x 25 lbs. per ft.	115 00	176 30
8 in. x 28 lbs. per ft.	132 50	203 00
9 in.	158 70	243 20
10 in. x 32 lbs. per ft.	147 20	225 60
10 in. x 40 lbs. per ft.	189 50	290 50

Ontario list—All points from Kingston and west to, but not including Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 48
1/4 in. and 3/8 in.	2 82	4 89
1/2 in.	3 57	5 57
3/4 in.	4 26	6 96
1 in.	6 29	10 29
1 1/4 in.	8 51	13 92
1 1/2 in.	10 18	16 64
2 in.	13 69	22 39
2 1/2 in.	21 65	35 39
3 in.	28 31	46 28
3 1/2 in.	34 04	55 66
4 in.	40 33	65 95

Lapweld

	Black	Galv.
2 in.	15 17	23 87
2 1/2 in.	22 23	35 98
3 in.	29 07	47 05
3 1/2 in.	34 96	56 58
4 in.	41 42	67 04
4 1/2 in.	50 80	81 92
5 in.	59 20	95 46
6 in.	76 80	123 80
7 in.	107 10	165 40
8 in. x 25 lbs. per ft.	112 50	173 80
8 in. x 28 lbs. per ft.	129 60	200 20
9 in.	155 30	239 80
10 in. x 32 lbs. per ft.	144 00	222 40
10 in. x 40 lbs. per ft.	185 40	243 30

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 00	$17 75
Copper, crucible	21 00	21 00
Copper, heavy	20 75	20 75
Copper wire	20 75	20 75
No. 1 machine compos'n.	16 50	16 25
No. 1 compos'n turnings.	14 75	14 00
New brass clippings	16 00	14 00
No. 1 brass turnings	11 75	11 25
Heavy melting steel	9 00	9 30
Boiler plate	11 75	14 00
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	10 50	9 00
Stove plate	9 50	8 50
No. 1 machin'y cast iron	14 75	14 00
Heavy lead	7 25	7 25
Tea lead	6 25	6 25
Scrap zinc	15 00	15 75
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	60
Stove bolts	72 1/2
Plate washers	30
Machine bolts, 3/8 and less	52 1/2
Machine bolts, 7-16 and over	42 1/2
Blank bolts	42 1/2
Bolt ends	42 1/2
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in.	$3.75 per lb. off
Nuts hex., over 1 in.	$2.00 per lb. off
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	42 1/2
Boiler rivets, base, 3/4-in. and larger	$4.35
Structural rivets, as above	4.10
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS.

	Per cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	60
Finished nuts over 1 in.	55
Semi-Fin. Nuts up to 1 in.	60
Semi-Fin. Nuts over 1 in.	55
Studs	45%

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	66 00
Wire rods, Pittsburgh	57 00

NAILS AND SPIKES.

Standard steel wire nails, base	$3 45	$3 40
Cut nails	3 15	3 20
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	$3 75	

MISCELLANEOUS

Solder, guaranteed	0.31½
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.80
Linseed oil, raw, single bbls.	.98
Linseed oil, boiled, single bbls.	1.01
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	6.00
Lead wool, per lb.	0.13
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto	25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	50
Standard drills over 1½ in.	15
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	10
Bit stock	50
Ratchet drills	15
Machine bits for wood	20
S.S. drills for wood	20
Wood boring brace drills	35 and 5
Electricians	20
Sockets	50
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks	list plus 5
Bridge reamers	55
Centre reamers	5
Chucking reamers	5
Hand reamers	5

High speed drills and reamer prices withdrawn.

COLD ROLLED SHAFTING

At mill	List plus 10%
At warehouse	List plus 20%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 5 per cent.; B and C, 25 per cent.; cast iron, 50 and 10; standard bushings, 60 per cent; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$3 90
Sheets, black, No. 10	4 35	4 35
Canada plates, dull, 52 sheets	4 00	4 25
Canada Plates, all bright	6 30	6 00
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	6 75	6 75
Premier, No. 28, U.S.	6 75	6 90
Premier, 10¾ oz.	7 50	6 95

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.35
⅜ in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
⅝ in.	6.35
¾ in.	6.15
⅞ in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B B

⅛ in.	$14.00
3-16 in.	10.45
¼ in.	7.15
5-16 in.	5.65
⅜ in.	4.60
7-16 in.	4.60
½ in.	4.60
⅝ in.	4.45
¾ in.	4.45

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	70
Kearney & Foot, Arcade	70
J. Barton Smith, Eagle	70
McClelland, Globe	70
Black Diamond	65
Delta Files	70
Nicholson	70
Globe	70
Vulcan	70-10
Disston	70

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	....
1¼ in.	19 55	....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	12 10
2¼ in.	26 60	13 30
2½ in.	29 00	15 95
3 in.	38 79	16 06
3½ in.	44 00	22 00
4 in.	49 50	27 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.23
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	.04¾
Lard oil, per gal.	1.28
Thread cutting oil	.54
Imperial quenching oil	.38
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 ft.
Galvanized, 24 wires, ⅜ in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble,	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.15¼
Peerless	.15¼
Grand	.14¼
Superior	.14¼
X L C R	.13¼
Atlas	.13¼
X Empire	.12¼
Ideal	.12¼
X press	.11¼
COLORED.	
Lion	.09½
Standard	.08¾
No. 1	.08¾
Popular	.07¾
Keen	.06¾
WOOL PACKING.	
Arrow	.20
Axle	.15
Anvil	.11
Anchor	.09
WASHED WIPERS.	
Select White	.09
Mixed Colored	.07
Dark Colored	.06

This list subject to trade discount for quantity

COPPER SHEETS

	Montreal	Toronto
Bars. ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 m..	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.34 to .36
Tin	.50 to .54
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs, American..	.03 to .04
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass...	.15 to .25

Prices Per Lb.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy	.35
Copper sulphate	.25
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)..	.20
Silver chloride ....(per oz.)	.65
Silver nitrate ....(per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., April 3, 1916.—No feature of special interest has developed in the industrial situation, and conditions seem to be quietly adjusting themselves to the opening of spring and summer business. The high cost of materials will undoubtedly have considerable effect on the volume of domestic business taken up this year. While present abnormal conditions prevail it is very unlikely that any but urgent necessities will be undertaken. Even if prices were no objection, the extraordinary war situation leaves little prospect of obtaining material for domestic purposes.

Pig Iron

The pig iron situation, while apparently unchanged, is nevertheless assuming a position where higher prices may be expected. The demand is as great as ever, and the supply does not appear to exceed the requirements of the steel makers. There is at present no visible shortage, but stock supplies are gradually decreasing. Considerable difficulty has been experienced by the inability to secure shipments of raw material, owing to the congested condition of railroad facilities.

Locally, the situation is unchanged and prices are firm.

Steel

The general industrial situation is showing signs of steadying down, and a quieter feeling seems to prevail throughout the steel and iron market. Future demand is not so pronounced, and consumers are not anxious to place further orders at present prices for material they will not require for many months. While this may be some indication of an easier market, the mills are showing no uneasiness, as they welcome the relief it offers. Producers are filled up for the balance of the year, and the pressure for delivery is still very great. The feeling is abroad that prices have about reached the high level, and the general interests are waiting for further developments. Reports from the Pittsburg district intimate that it is now possible to secure certain material from sources that a month ago were unable to book orders. Pittsburg quotations on open-hearth billets have advanced $5 a ton, being quoted at $50. Forging billets show a similar increase, this week's price being $75 a ton. Steel bars, Pittsburg, are higher by ¼c, being quoted at 3¼c. Structural shapes have advanced 25c per hundred, and this week's price is $2.75. The sheet mills are practically sold out on blue annealed sheet for the remainder of the year, but light black and galvanized can be contracted for, on three or four months' delivery. Chicago prices on blue annealed sheets are now quoted at 3.189c, or an advance of 1c over the previous week. Steel pipe shows an advance, the discount being 72 per cent. in place of 73. Wrought iron pipe shows a similar advance, the present discount being 62 per cent. Pittsburg spike prices are higher; railroad quoted at $2.75 and small at $3 per hundred.

Metals

The week has been comparatively quiet in all metals during the past week, but indications of activity are apparent from conditions which are now developing. Copper is taking on strength after a period of dullness, and prices are expected to again advance. Tin is in greater demand, and consumers are continually making inquiries. Lead has become stronger, following an advance of Trust prices. Spelter is quiet, with the supply greater than present demand.

Copper.—The copper situation is again showing signs of a further upward movement. Large purchases are reported, following a heavy demand for future metal. Both the home consumers and foreign buyers are making inquiries for large quantities of metal. If recent inquiries develop into purchases it is more than likely that prices will be advanced by producers to protect their future supply. London reports an advane of £2 10s. on spot and £3 on futures. This additional advance over that of last week is largely owing to an apparent copper shortage developing in Great Britain. The prospects are that the British requirements this year will be far greater than the present supply will take care of, and the indications point to yet higher prices in copper. The copper interests in the States, however, have not yet been affected by the recent developments in the foreign situation; in fact, some producers are quoting slightly easier figures, but intimate that prevailing conditions will ultimately cause a further advance. Local conditions are unchanged, and prices are firm

at 31c for lake and electrolytic, and 30c for castings.

Tin.—Heavy consumption and continued demand still feature the tin situation. It is reported that some dealers have been unable to fill contracts, and are making strong efforts to buy tin to accommodate customers. The difficulty of securing supply is responsible for premiums being placed on nearby metal. It is thought that consumption will be still greater during the next few months. Nearby and early futures are firm and active, while far futures are somewhat easier, in anticipation of a lower market. London quotations are 15s. lower, and prices on Straits tin have declined £2. The New York markets are quoting a nominal price of $49.25, a reduction of three-quarters of a cent. Local dealers have advanced their prices 1c per pound, this week's price being 51c per pound.

Spelter.—Several unlooked-for sources of supply have recently developed. The production has apparently increased to such an extent that a shortage of metal seems very unlikely at the present time, and prices are expected to remain firm unless an exceptionally heavy demand is made for additional metal. This will possibly show itself shortly, for previous activity in copper has also affected the spelter situation, as brass interests are more or less concerned in both metals. London has advanced prices on spot £3 per ton, but conditions here are practically unchanged and prices are firm at 23c per pound.

Lead.—The leading lead interests are still controlling the market by maintaining a lower price than outside interests. They are evidently holding to the belief that the domestic consumer should be protected from any unnecessary advance in prices, due to extraordinary war conditions. However, the recent action of the Trust in placing an additional half cent on their quotation has had much to do with the present strength of the market. The decline noted last week on the New York market has been changed to a similar advance, and the outside interests are again quoting 8⅛c. The Trust price is now 7½c per pound. London prices are easier, and a decline of 10s. is noted on spot and 8s on futures. Local prices are firm and unchanged at 10c per pound.

Antimony.—The situation is a little stronger, with increased demand, but quotations are holding firm at 48c.

Aluminum.—The market is a little stronger in the States, and prices show a slight advance, but local conditions are unchanged, with prices firm at 68c.

Machine Tools and Supplies

The machine tool industry is gradually assuming normal conditions, and the demand for munitions equipment is constantly falling off, but in several cases firms are still engaged in filling orders for shell equipment. However, the bulk of this class of tools have now been placed, and with the exception of a few scattered orders, it is not expected that any great demand will be made along these lines. The domestic requirements, while not large, are continually improving, and future developments may put the machine tool business more on a normal basis. During the past year or more many new lines of manufactured articles and processes have been placed before the Canadian manufacturers, and with those which have been developed, and also those now under consideration, the prospects are that renewed activity for necessary equipment will soon be evident in machine tool plants.

Old Materials

The market in scrap metals has been quiet during the past week and heavy sales have been few. Prices, however, are very firm, remaining unchanged, with some showing slight advances. Brass clippings and turnings show an advance of ½c, this week's price being 16c and 11¾c respectively. Aluminum is in good demand, and dealers are asking 36c, an advance of 1c per pound. Scrap zinc is easier at a decline of ¾c, being quoted at 15c per pound.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Toronto, Ont., April 4.—A gratifying feature of the industrial situation is the steady improvement in domestic business due to the prosperous condition of the country. The outlook for an increase in the export business, other than munitions and war supplies, has improved considerably and manufacturers are looking for important developments. The spring weather has had a stimulating effect on some industries and the outlook generally is distinctly favorable. Navigation will be open on the Lakes for the season very shortly which will considerably relieve the congestion of freight on the railways. The situation in this regard is getting more acute and has caused considerable delay to shipments and inconvenience to merchants. The customs returns for Toronto for the fiscal year which ended on March 31, are almost two million dollars in excess of the greatest previous year in the history of the port. These has been a very marked gain in revenue since September, and March showed the largest increase for any month.

Manufacturers are becoming concerned over the shortage of labor which is the beginning to be felt, and which will become more serious as the number of battalions increases. The shortage of raw materials is becoming a serious question for manufacturers to contend with, and prices are still rising, thus increasing the cost of production. The upward trend in prices of finished products continues, a number of advances having been made during the week. The most important of these are carbon drills and reamers, shafting, copper rivets, cap and set screws, and kindred lines.

Steel Market

The market continues strong and prices are still moving upward. The opinion is held in some circles that the high point for prices has probably been reached or nearly so, but at the same time a recession in quotations is not expected for a long time to come. The fact that the steel mills have all the business they can take care of this year will have a tendency to steady the market and prevent any marked decline. Steel companies are making strenuous efforts to develop their export business and considerable success in this direction in anticipated. The mills continue to be actively engaged in the production of steel for shells, the demand still being very insistent. Export business is developing and there has recently been a noticeable improvement in the domestic demand.

An advance in steel shafting has been announced, the new price being list plus 20 per cent. at warehouse, and list plus 10 per cent. at mill. The market for boiler tubes is very firm and an advance in prices is looked for. Tube mills are sold up for four or five months, consequently deliveries are very backward. Prices on boiler plates are firm and a further advance is expected owing to the sold-up condition of the plate mills. Prices of wrought iron and galvanized pipe have advanced in the States and a similiar movement may take place here. Steel bars are firm and unchanged at $3, and iron bars at $2.75 per 100 lbs.

The galvanized sheet situation is unchanged and the market continues very firm. The uncertainties of the spelter market and high prices are not attractive to the galvanizers who are also confronted with increasing prices on black sheets. The demand for black sheets in the primary market is on the increase and many mills are well sold ahead. In some cases orders now on the books run well into the fourth quarter. Quot-

ations locally on black sheets are firm and unchanged.

The steel market in the United States is very strong and prices still have an upward tendency. It is believed in some quarters however that the top of the market has probably nearly been reached and that prices will remain at the high level for some considerable time. The larger steel companies are booked up for the rest of the year and some inquiries have been received for 1917 delivery. Steel bars are unchanged at 2.75c, plates 3.50c, and shapes 2.50c f.o.b. Pittsburgh. Prices of semi-finished steel products are very firm and will probably advance. Billets are now in great demand but prices are unchanged. No wire rods for the open market can be had from Pttsburgh mills, and quotations are very firm at $57 per ton.

Pig Iron

The market is very firm and the general situation is unchanged. Indications point to very heavy consumption this year of steel making grades of pig iron. The Nova Scotia Steel & Coal Co., propose building a new blast furnace at their plant at Sydney Mines, C. B.

Old Metals

There is no change in the situation and quotations are practically the same as last week. All copper scrap is in good demand and prices firm. There is a good demand for heavy melting steel and the market is strong. Old lead is strong in sympathy with the pig lead market, but prices are unchanged.

Machine Tools

The market is fairly active, the bulk of the business in machine tools being for munition plants. Canadian machine tool makers continue busy turning out lathes and also special tools for machining shells. Deliveries from U.S. makers have not improved and are still very backward especially on standard tools.

Supplies

A good demand is reported for machine shop supplies, buying being generally of the hand-to-mouth type. Prices continue to advance, the most important change this week being the new discounts on carbon drills and reamers which have advanced about 10 per cent. New discounts are also given this week on cap and set screws, nuts, etc. Turpentine has advenced 1c and is now quoted at 80c per gallon. Prices of wool packing waste and washed wipers have been withdrawn and are only on application. This step has been taken on account of the great scarcity of wool yarns and cotton rags. The market is very strong and an advance in white and colored waste is expected in the near future owing to the scarcity and increase in cost of cotton threads.

Metals

The most interesting feature to note in the metal markets this week is another advance in lead, otherwise prices are at about the same level as last week. Stocks of all metals are low in Toronto and prices on the local market are very sensitive. Business is very good having improved considerably during the past few weeks. The copper market is stronger due to a large buying movement which may result in higher prices. Tin is also strong and may possibly advance. The lead market is strong and higher after a period of comparative dulness. The antimony and aluminum markets are strong with nominal quotations. Solders are unchanged but very firm and higher prices are very probable.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendance Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian.—Col. N. Golejewski, Military Attache, Room 904, Flatiron Building, New York City, N.Y.

Copper.—An active demand for copper has developed into a strong buying movement and there is every possibility of higher prices. The consumption of copper in Europe is said to be far in advance of the present shipping facilities and an urgent need exists for this metal. There is also an abnormal demand for spot copper in the States but very little is available. The local market is strong with quotations unchanged and nominal at 30½c per pound.

Tin.—The market is easier in London but firm and unchanged at New York. The outstanding features in the tin situation continue to be heavy consumption and difficulty of getting supplies. The New York market is still affected by the delays attending the granting of licenses permitting exports of metal from England. The situation is rather tight and higher prices may be looked for. Quotations are unchanged and nominal at 53c per pound.

Spelter.—The market is more active and firmer. It is possible that the buying movement which has already started in copper may extend to spelter as both metals are used together at the brass mills. Production has been greatly increased and it is doubtful if prices can go much higher unless some extraordinary demand develops. The market is firm at 22c per pound.

Lead. — The "Trust" has again advanced prices of lead and is quoting at 7.50c New York. The outside market is higher still, the price ranging from 7.87c to 8.12c. The market is very strong and the demand continues heavy with a scarcity of spot metal. Lead has advanced ½c and is now quoted at 11c per pound.

Antimony.—The market is strong and the demand is heavy but supplies are scarce. Quotations are nominal and unchanged at 48c per pound.

Aluminum.—The situation is unchanged and the market is strong at 68c per pound.

Solders.—Prices are very firm and an advance is not unlikely owing to the continued strength in the tin and lead market. Guaranteed is quoted at 31½c and strictly at 29c per pound.

NOVA SCOTIA STEEL & COAL CO.

SELDOM has such widespread interest been manifested in any meeting of the Nova Scotia Steel & Coal Co., as was shown in the recent annual meeting of shareholders. It was known that the company had had a most successful year and besides a number of important announcements were looked for. Col. Thomas Cantley President and General Manager presided and in moving the adoption of the directors' report and statement of accounts, Col. Cantley said in part:—

"During the past thirty odd years with which I have had the privilege of being connected with the Scotia Company, the corporation and its management have passed through some anxious and trying years, but in all my experience I cannot recall a year where the issue involved in the fluctuations and departure from normal conditions were anything like so great as during 1915.

Iron and Steel Trade

"In last year's report reference was made to the depressed conditions of the iron and steel trade as experienced for the great part of that year and which reached a crisis with the outbreak of the great war at the beginning of August and for two months following largely paralyzed the ordinary activities of the company. It was only during the last few weeks of that calendar year, (1914), that any improvement was manifested when certain munition work was

undertaken and some two hundred thousand shrapnel shell bodies were produced at the New Glasgow plant. That report pointed out that when the year closed the Company had been entrusted with ordnance material orders sufficient to keep the plant fully occupied for the first six months of the year, 1915.

"The additional forging presses and other plant requisites for the execution of the very considerable order then entrusted to the Company were installed as rapidly as possible. Equipment for the finishing and assembling of shrapnel shells was also then installed. This was followed in May by building and equipping a second finishing department for machining and assembling 4.5 and 60 pounder high explosive shells. For the calendar year, 1915, there was manufactured in the Company's forges nearly three million of shell bodies, comprising four different sizes of shrapnel and high explosive shells. During the closing months of 1915 we contracted for a further large tonnage of shell forgings, including large sizes than have hitherto been made in the Dominion.

To enable us to undertake this munition work it was decided to install a further unit of larger and more powerful presses, for forging shells up to 19 inch. diameter. Orders for the necessary presses, accumulators, pumps, boilers and other plant have been placed and the foundation for this machinery is now all in place. The buildings erected are practically completed, some other plant is already on the ground and the balance will be installed as soon as we can get delivery, and it is expected that within a few weeks we will be turning out a considerable tonnage of large shells.

To aid in providing the large additional quantity of steel required to fill the contracts referred to, the directors in November last decided on an additional sixty-ton open-hearth furnace at Sydney Mines and this furnace was actually producing steel within four months from the date of that decision, which, under existing conditions, we considered good work. The iron and operations were considerably greater than in 1914, and were as follows:—Coke made 90,277 tons, limestone and dolomite quarried 79,211 tons, pig iron made 73,110 tons, steel ingots made at Sydney Mines 97,072 tons. Steel billets rolled at New Glasgow 76,082 tons, total shipments of finished steel forgings from New Glasgow plants being 62,283 tons.

Coal Trade

"Owing to the great shortage of suitable steamers for transportation, the abnormally high cost of shipping and shortage of skilled labor, due to enlistments, mining was not proceeded with as vigorously as in former years, the total coal mined being 618,103 tons, or 134,050 tons less than the previous year. Of this tonnage there was used in the manufacture of iron and steel and other plants of the company 284,971 tons, or 110,323 tons more than the previous year.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Hamilton, Ont.—The Canada Wire & Iron Goods Co. will build an addition to their plant.

Berlin, Ont.—The Canadian Regal Motor Co., will build a factory here to cost about $18,000.

Berlin, Ont.— Fire damaged the premises of the Forwell Foundry Co., and caused a loss of $5,000.

Midland, Ont.—D. G. Dobson, is in the market for a heavy duty gasoline or oil marine engine of 40 to 60 h.p.

Hamilton, Ont. — The Steel Co., of Canada, will build an addition to its plant, estimated to cost $24,000.

Coaticook, Que.—An addition will be built to the plant of the Belding Paul-Corticelli, Ltd., and new machinery installed.

Winnipeg, Man.—The Greater Winnipeg Water District Board have approved of alterations to the pipe line now under construction.

Niagara, Falls, Ont.—The Perfection Tire & Motor Co., of Fort Madison, Iowa, will have plans prepared for a factory to be erected here.

Brockville, Ont.—The Canada Foundries & Forgings Co., will make an extension to their plant here to take care of increasing business.

Guelph, Ont. — A company propose building a stove factory here at an approximate cost of $7,000. W. A. Mahoney of this city is the architect.

Thornburg, Ont. — The Standard Chemical Co., will build an addition to its plant and install two new ovens. Construction work will be started immediately.

Windsor Ont. — The Maxwell Motor Co., will begin building operations immediately on the new plant here. The initial unit will be 100 ft. x 300 ft. and will cost $65,000.

Kingston, Ont.—A Davis & Son, Ltd., is in the market for a gap lathe, 16 in. x 15 ft., to swing 30 in. in the gap, with countershaft, chuck, steady rest compound rest and screw-cutting gear attached.

Halifax, N.S.—At a meeting of the Board of Directors, of the Nova Scotia & Coal Co., it was decided to proceed at once with the erection of another blast furnace at Sydney Mines, to cost from $200,000 to $300,000.

Winnipeg, Man.—The Baldwin Mfg. Co., which has juse secured a charter and is capitalized at $1,000,000, will erect a plant here for the manufacture of grain threshers. G. L. Constable, of Winnipeg, is president.

Fredericton, N.B. — The Fredericton Gaslight Co., has about completed arrangements for the extension of their lines to the east side of the St. John River. The company intends to expend between $25,000 and $30,000 in this projected work.

St. John, N.B.—The Bay of Fundy Tide Power Co., which was recently incorporated will install a hydro-electric plant at Cape Split. The initial unit will be 10,000 h.p., but provision will be made for future development. George B. Cutten, of Acadia, N.S., is president of the company.

Municipal

Bow Island, Alta.—The town council propose spending $1,660 on public works and $1,725 on a natural gas lighting system.

Stratford, Ont.—There is now a probability that North Easthope Council may resubmit the hydro radial by-law, defeated by a large majority in January.

London, Ont.—The first unit of the new pumping plant has been installed at the Springbanks station. The entire plant is being overhauled and made more efficient.

Sarnia, Ont.—Owing to the serious water wastage through leaky mains it is proposed to have the system surveyed which would cost about $2,000. The loss through wastage is estimated at $25,000 a year.

Galt, Ont.—Two by-laws will be submitted to the ratepayers on April 28; one to raise $12,000 for the purchase of a motor fire engine, and the other to authorize an expenditure of $16,000 on a fire alarm system.

Saskatoon, Sask.—The city council propose to install the following works and equipment: Incinerator, $100,000; switchboard, $8,000; motor converter. $16,000; boiler feed pumps, $2,000, and completion of a water main, $28,000.

Highgate, Ont.—The Hydro-Electric Power Commission has advised that Highgate will be given first consideration in the construction of new lines.

Grand Valley, Ont.—A by-law has been carried authorizing the construction of a hydro electric system, at an approximate cost of $11,000.

Tenders

London, Ont.—Tenders will be received by the Board of Control, up to April 10, for a five-passenger car for fire department use, and 1,000 feet of 2½-inch cotton rubber-lined hose. John Aitken, fire chief.

Toronto, Ont.—Tenders will be received by the chairman, Board of Control, City Hall, Toronto, up to April 11, 1916, for the purchase from the city of the following: 200 long tons 30-pound rail; 20 only No. 5 x 30-pound switches. Specifications may be obtained at the Works Department, Room 12, City Hall.

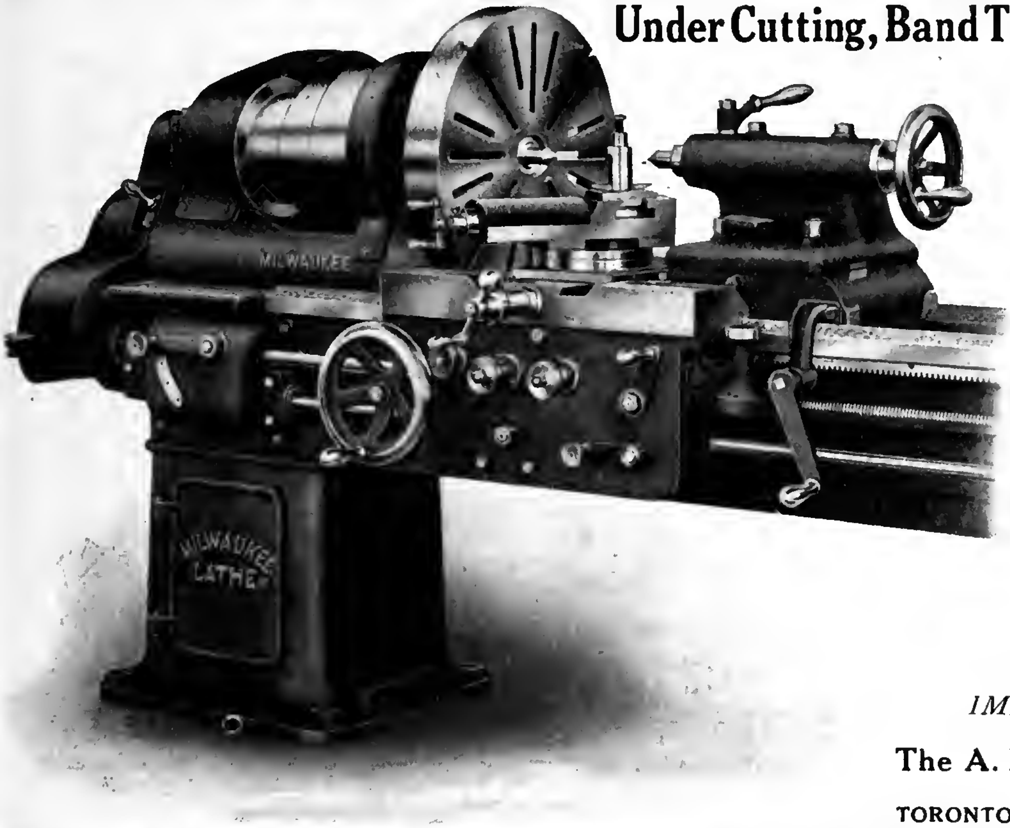
Toronto, Ont.—The Board of Education will receive tenders up to April 11, 1916, for one motor for ice machine, two motors for ventilating fans, one motor and sump pump. Plans and specifications may be seen at the principal's office, Central Technical school, Lippincott street.

Calgary Alta.—Tenders sealed will be received until April 15, for the supply of all materials, tools and labor necessary for the construction of one to fourteen elevators. Plans and specifications can be obtained upon application to the Alberta. Farmers' Co-Operative Elevator Co., Calgary.

Hamilton, Ont.—Tenders addressed to the chairman Board of Control, will be received up to April 10, 1916, for the several works required in the erection of a Nurses' Home for the Mount Hamilton Hospital. Plans and specifications may be seen at the office of Stewart & Witton, architects, Hamilton.

Toronto, Ont.—Tenders will be received by the chairman, Board of Control, City Hall, up to April 11, for the supply and delivery of: Electrically operated driving gear for operating 36-inch gate valves, at main pumping station, John street. Specifications and forms of

24″ Standard Milwaukee Lathe for Finish Turning, Wave Grooving; Under Cutting, Band Turning and Rectifying



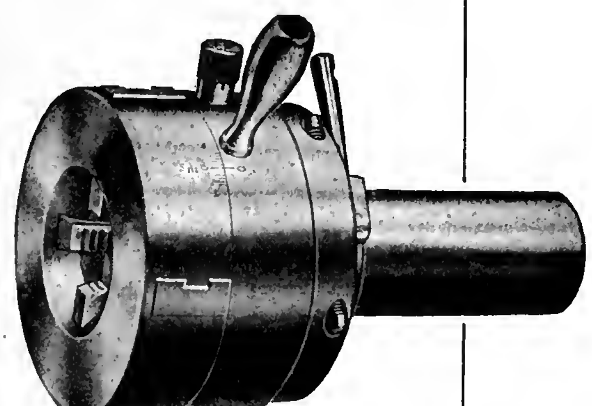
SPECIFICATIONS:

Swing over Bed.....	24½″
Swing over Carriage	15¾″
Dimensions of Front Bearing	3¾″ x 7″
Dimensions of Rear Bearing	3″ x 5″
Hole through Spindle	2 1-16″
Diameter of Spindle Nose	3½″
Pitch of Thread on Spindle	5
Diameter of Tail Spindle	2¾″
Taper Hole in Spindle Bushing.	No. 5 Morse
Cone Diameters ...	9¼″, 12⅛″, 15″
Width of Steps on Cone	4⅛″
Ratios of Back Gearing	3.45 to 1 & 12 to 1
Length of Carriage	30″
Width of Bridge	9½″
Pitch of Lead Screw	4
Cut Threads from	1 to 16
Size of Turning Tool	¾″ x 1⅜″
Depth of Bed	15″
Width of Bed	20″
Length of Tail Stock on Bed	17″
10′ Bed takes between Centers, with Tail Stock even with end of Bed	5′ 6″
Countershaft Pulleys	16″ x 6″
Countershaft should run ...	150
Net Weight with 10′ Bed..	5,000 lbs.

IMMEDIATE DELIVERY

The A. R. Williams Machinery Co. Limited
TORONTO CANADA

Give Him A Chance



Give the man who has to do the work a chance to say what tools give best results, and then give him the best.

Among all the users of Geometric threading dies, a dissatisfied man has not been found.

We have a Geometric Self-Opening and Adjustable Screw-Cutting Die Head for you, also, and want you to have it.

Geometric Die Heads can be arranged for use on any make of Screw Machine or Turret Lathe.

Let us know the requirements of your thread-cutting operations, and we will send you full particulars of the most suitable Die-Head.

The Geometric Tool Co.

NEW HAVEN :: :: CONN.

Canadian Agents:
Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

tender may be obtained at the Works Department, Room 12, City Hall.

Quebec, Que.—Tenders for freight shed and grain galleries, will be received at the Quebec Harbor Commissioners' Office, Pointe-a-Carey Wharf, Quebec, up to April 15 next. Plans and specifications of the contemplated work may be seen at the harbor engineer's office, Pointe-a-Carey Wharf St. George Boswell, chief engineer.

Vancouver, B.C.—The British Columbian Fisheries, Ltd., will sell their entire plant and equipment, including buildings, machinery, tools, refrigerating plant, sawmill and machinery, fertilizer plant and equipment, power plant equipment, steam trawlers and scows, etc. Tenders will be received up to April 15, and full particulars may be obtained from James Keppel Ball, Yorkshire Building, Vancouver, B.C.

Collingwood, Ont.—Tenders will be received by the chairman of the Collingwood Water and Light Commission until April 11, for the following works—(1) Pumping machinery, comprising two motor-driven units, 1,000 Imperial gallons capacity each. (2) Pump well and connections. Plans and specifications may be seen at the office of the Chipman and Power Engineers, 204 Mail Building, Toronto, or at the office of the Water and Light Commission, Collingwood. Hugh A. Currie, chairman.

General Industrial

The Vaudreuil Electric Co., of Vaudreuil, Que., has increased its capital stock to $200,000.

The Ontario Steel Products Co., Montreal, has received a new and remunerative order for springs.

Toronto Ont. — F. A. Hallman will build an addition to the factory on Logan Ave., at a cost of $1,000.

The Alaska Feather & Down Co., Montreal and Winnipeg has changed its name to the Parkhill Mfg. Co.

Brampton, Ont.—The Acme Rubber Co. propose to build a factory, at an approximate cost of $30,000, and a by-law will be submitted to the ratepayers.

New Incorporations

The Govan Motor & Machine Co., of Govan, Sask., has been incorporated with a capital of $20,000.

The Commercial Motor Bodies & Carriages, has been incorporated at Ottawa, with a capital of $40,000 to acquire and take over as a going concern the carriage and woodworking business of C. Kloepfer, Toronto, Ont.

The Gilson Manufacturing Co., has been incorporated at Ottawa with a capital of $150,000 to manufacture gasoline engines, etc., at Guelph, Ont. Incorporators: Edward Barelman, Walter Ellis Buckingham and Robert Kennedy Dawson, all of Guelph, Ont.

The Peerless Weaving & Belting Co. has been incorporated at Ottawa, with a capital of $150,000 to manufacture cotton and leather belting at Hamilton, Ont. Incorporators: Edward De Ette Matteson, Edward Frederick Gingras and Jacob iDlche, all of Buffalo, N.Y.

Silks Limited has been incorporated at Ottawa, with capital of $500,000 to manufacture silks and other textiles. Head office is at Toronto, Ont., and the incorporators are Joseph Powley, Geoffrey Adams and Edwin Smily, all of Toronto, Ont.

The Dominion Casket Co., has been incorporated at Ottawa, with capital of $100,000 to manufacture caskets, boxes, wagons, etc., at Guelph, Ont. Incorporators: William Pears, of Toronto, and Wm. George Whitehead, and James Mason Arnold of Guelph, Ont.

The Canadian China Clay Co., has been incorporated at Ottawa with a capital of $1,500,000 to develop minerals and other deposits. Head office Mintreal, Quebec. Incorporators: Francis George Bush, George Robert Denham and H. William Jackson, all of Montreal, Que.

The Great Lakes Power Co., has been incorporated at Toronto, Ont., with a capital of $2,600,000. To develop hydro-electric steam or other power. Head office at Sault Ste Marie, Ont. Incorporators, John Alexander McPhail and William Eberts Brown of Toronto.

The Hall Motors Ltd., has been incorporated at Toronto, Ont., with a capital of $40,000 to manufacture automobiles, motor cycles and bicycles with head office at Toronto, Ont. Incorporators, Robert Halls Vankempen, Adam Blackhall Mitchel and William M. Hall all of Toronto.

The London Creamery, Ltd., has been incorporated at Toronto, Ont., with a capital of $40,000 to manufacture condensed, preserved and evaporated milk, with head office at Toronto, Ont. Incorporators, Albert Weber Vale, Ralph Turnbull Francis and John Mitchell all of Toronto.

The Standard Milk Products, Ltd., has been incorporated at Toronto, Ont., with a capital of $150,000 to manufacture condensed and evaporated milk. Head office at Toronto, Ont. Incorporators, Harold Leslie Grimshaw, Edward John Swift and Edward B. De Camps all of Toronto.

The Pierrefonds Electric Co., has been incorporated at Ottawa, with a capital of $50,000 to carry on the business of an electric light, heat and power company, at Ste. Genevieve de Pierrefonds, Que. Incorporators: Joseph Bernard, George St. Germaine and Napoleon Nantel, all of Montreal, Que.

The Iron Works, has been incorporated at Ottawa, with a capital of $96,000 to carry on a general foundry, boiler and machine shop business at Owen Sound, Ont. Incorporators: Frances Howard Kilbourn, John McEwen and Samuel A. McDougall, all of Owen Sound.

The Boico Company has been incorporated at Toronto, Ont., with a capital of $40,000 to carry on the business of mechanical hydraulic and civil engineers and contractors with head office at Toronto, Ont. Incorporators, Joseph Max Bullen, Harold Learoyd Steele and Francis H. Hurley all of Toronto.

The International Molybdenum Co. has been incorporated at Ottawa, with a capital of $5,000,000 to develop, refine and otherwise treat ores, metals and minerals substances of all kinds, at Renfrew, Ont. Incorporators: Reginald Holland Parminter, Arthur John Thomson and William Symon Morloch, all of Toronto, Ont.

The Hudson Bay Zinc, Ltd., has been incorporated at Victoria, B.C., with a capitalization of $5,000,000, divided into 1,000,000 shares. The company is empowered to carry on a mining and smelting business and to purchase from Maurice W. Bacon and William E. Cullen, Jr., 14 mining claims situated in the Kootenay mining division. The Hudson's Bay Company has its headquarters at Salmo. Maurice W. Bacon and William E. Cullen, Jr., are at present associated with others in the operation of the Hudson Bay mine at Salmo, which it is believed will be the principal property to be controlled by the new company.

Contracts Awarded

Three Rivers, Que.—The general contract for the erection of an addition to the plant of the Canada Iron Corporation has been awarded to Loomis Dakin & Co., Sherbrooke, Que.

Winnipeg, Man.—The Economy Foundry Co., of Portage la Prairie, Man., has been awarded a $25,000 contract for ornamental ironwork by the T. Eaton

Co., in connection with the erection of the new buildings.

Victoria, B.C.—The city council has awarded contracts to the Dunlop Tire & Rubber Co., for chemical couplings; the Canadian Consolidated Rubber Co., for 1 in. and 1½ in. chemical hose; the Canadian Consolidated Rubber Co., Dunlop Tire & Rubber Co., and the Goodyear Tire Co., for 2½ in. fire hose, and the Northern Electric Co., for 6 miles of wire.

Trade Gossip

Rail Mills Busy.—The rail makers in Canada are reported to have opened their books covering deliveries for the first six months of 1917. Several thousand tons have been booked.

The International Nickel Co. has informed the Dominion Government of its intention to begin the erection of the Canadian plant immediately. The company is understood to have under consideration a site on the Atlantic coast somewhere in the vicinity of Halifax, although the exact details in regard to this have not been given.

The Canadian Westinghouse Co. of Hamilton, Ont., enjoyed a prosperous year, according to the reports submitted at the annual meeting held in Hamilton on March 29. The financial statement to December 31, of last year showed net earnings of $860,628. The company now has a surplus of $2,570,000 and is in a strong condition financially. A dividend of 9 per cent. was paid during the year. The following directors were elected: H. H. Westinghouse, L. A. Osborne, P. J. Myler, T. Ahearn, Sir John M. Gibson, J. F. Miller, W. Y. Soper, C. S. Sise, Chas. A. Terry and G. E. Cripp.

Granby Output. — Granby Consolidated Mining, Smelting & Power Co., in February produced 2,690,265 pounds of copper. Production for a series of months has been: February, 2,690,265 pounds; January, 3,122,879; December, 3,775,335; November, 3,575,974; October, 4,124,499; September, 4,119,337. Beginning with November, the production figures reflect the severe weather experienced, but output is now expected to show gradual improvement until the 4,000,000 pounds monthly mark is again attained.

Asbestos and Nickel Export.—A delegation of owners of asbestos mines waited on the Commissioner of Customs at Ottawa, on March 28, to inquire into the terms of the Order-in-Council prohibiting the export of nickel and asbestos to any but British possessions, the trade being uncertain as to whether the exportation under special license, which is to be allowed with regard to nickel, would also apply to the case of asbestos. An assurance was given that this is the case, and that licenses will be issued where the Government is satisfied as to the destination o fthe shipments.

Lumber for Freight Cars.—Europe is in the market for exceptionally large supplies of lumber, for freight car construction, and American lumber manufacturers have orders to ship up to 75,000,000 feet. This is exclusive of a big order placed by Russia for 40,000 cars last autumn. Requests include all types of freight cars, including several special types. Italy wants 2,000 box cars, and France 1,000 flat and 500 box cars, and 1,500 box car parts. A Nova Scotia concern received orders for 2,000 cars from the French Government, it is said, and the American Pressed Steel Car Co. gets an order for 50 box cars from China. Several more foreign orders are expected soon.

Great Freight Record.—A carload of freight every twenty-two seconds in the year—that is the remarkable record made by the Grand Trunk Railway system. During 1915 the Grand Trunk handled 1,376,189 carloads of freight, just about three cars every minute during the whole year. When it is stated that these cars, if gathered together, would make a train 10,416 miles in length—three times the distance be-

tween the Atlantic and Pacific oceans through Canada—some idea may be gained of what this railway is doing in handling the commerce of the Dominion. These figures are exclusive of the large amount of traffic handled by the Grand Trunk Pacific in Western Canada.

Paper Prices High.—Canadian paper makers are enjoying unprecedented prosperity, owing to the heavy demand for shipments abroad. As a consequence, Canadian consumers of stationery and general printed material are compelled to pay unusually high prices for their requirements, with prospects of very much increased prices over a period of the next few months. Ordinary calendered book paper (super-calendered book) has jumped in price from $5\frac{1}{4}$ to $6\frac{1}{2}$ cents per pound within the past week. Bond and other papers have advanced from 4 to 5 cents within the past two months. Newsprint also has advanced from $\frac{1}{2}$ to $\frac{3}{4}$ cent a pound to new buyers. Kraft is selling for export at 10 cents, compared with 4 cents a few months ago. The trade state that the cause is due to the big export demand, and to the renewed activities of Canadian consumers, who allowed their shelves to empty when general business was so bad a year ago.

Personal

William J. C. White, head of the firm of R. C. White & Co., engine and boiler makers, Montreal, died in that city on March 24.

George P. Breckon, head of the firm of G. P. Breckon & Co., sheet metal workers, Toronto, Ont., died suddenly at his plant on March 30.

George Smith, town engineer of Lindsay, Ont., died suddenly in Toronto on March 31, while on a visit to a friend. The deceased was 60 years of age.

Alonzo B. See, president of the A. B. See Electric Elevator Co., Montreal and New York, has been elected vice-president of the Machinery Club of the City of New York, to succeed the late John A. Hill, publisher of the American Machinist.

Donald Fraser, sen., one of New Brunswick's most prominent lumbermen, died at Fredericton on April 1. He built up what is believed to be now the largest lumbering and milling business in eastern Canada. He was a native of Scotland and was seventy-four years old.

N. Bruce McKelvie, of the firm of Hayden & Stone, Boston and New York, has been appointed a director of the Nova Scotia Steel & Coal Co., Halifax, N.S. Mr. McKelvie is a native of Prince Edward Island and was at one time on the Bank of Nova Scotia staff. This appointment completes the board of directors.

A. E. Wright, of the Dominion Steel Foundries, Hamilton, Ont., has been promoted to the position of secretary-treasurer, and **Fred W. Sherman** will assume the duties of purchasing agent. **Mr. Hammon,** who was formerly secretary treasurer has severed his connection with the company, and has taken up his residence in California.

Railways—Bridges

Quebec, Que.—A movement is on foot in the Saguenay district, notably at Bay St. Paul, to get the Federal authorities to extend the lines of the Canadian Transcontinental out from Quebec to St. Catharine's Bay, Saguenay, which is claimed as an excellent site for winter navigation up the river.

Building Notes

Toronto, Ont.—A company, headed by H. H. Williams, has taken out a charter for $1,000,000, and as soon as plans are perfected, propose to erect a large theatre at the corner of College and Teraulay Streets. It will have a very large stage and a seating capacity of from 4,000 to 5,000. No definite date has been set for the beginning of building operations.

Marine

North Vancouver, B.C.—The Amalgamated Dry Dock & Engineering Co., if it secures certain concessions, will erect a dry dock and shipbuilding plant at an estimated cost of five and a half million dollars.

Refrigeration

St. Thomas, Ont. — The St. Thomas Pure Milk Co., which has recently been incorporated, will install a plant for pasteurizing milk.

Toronto, Ont.—It is reported that the Delaware and Lackawanna Railroad have purchased a property here for a terminal to be used jointly with the C.N.R.

Wood-Working

Elmira, Ont. — Fire starting in the boiler room of the Bauman & Letson planing mills, completely destroyed the

Page 56 contains something that will interest you. Turn to it.

buildings on March 28, entailing a loss of from $15,000 to $20,000. The property was partly covered by insurance.

Catalogues

Blowing Engines made by the Nesta Machine Co., Pittsburgh, Pa., are dealt with in a catalogue recently issued. Some large installations are illustrated accompanied by a brief description.

Tool Steel.—The Vanadium-Alloys Steel Co. of Pittsburgh, Pa., has just issued two folders descriptive of their "Vasco Choice" and "Vasco Non Shrinkable" grades of tool, steel. These folders will be sent free upon request.

Book Review

Sampling and Analyzing Flue Gases is the title of bulletin No. 97, issued by the Bureau of Mines, Department of Interior, Washington, D.C. The bulletin by Henry Kreisinger, engineer, and F. K. Ovitz, assistant chemist, presents for the benefit of those in charge of boiler plants and all other persons interested detailed information on methods of sampling and analyzing flue gases, and on the utilization of the analyses in promoting boiler-room economy. This bulletin is intended to be a companion to Technical Paper 80, "Hand Firing Soft Coal Under Power-Plant Boilers," and is written in plain and non-technical language, as far as possible, so that it may be readily understood by persons who have not had the advantage of a technical education.

The material presented is arranged in two parts. The first part contains the description of the apparatus and the methods used in sampling and analyzing flue gases. The second part gives experimental results obtained with the different methods of sampling and collecting flue gas that are recommended in the first part of the report. Only simple apparatus and methods are considered, as they are accurate enough to show the large heat losses due to the use of too much air, and are also accurate enough to indicate any incomplete combustion losses of economic importance. Those who wish to obtain information on the more accurate methods of analysis of gases are referred to Bureau of Mines Bulletin 12, "Apparatus and Methods for the Sampling and Analysis of Furnace Gases," and Technical Paper 31, "Apparatus for the Exact Analysis of Flue Gas," which may be obtained from the Superintendent of Documents Government Printing Office, Washington, D. C., at a cost of five cents each. Bulletin 97 may be obtained by addressing the Director of the Bureau of Mines, Washington, D.C.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

FOR SALE—NO. 2 UNIVERSAL MILLING machine. J. A. Harvey, 16 Pearl St., Toronto.

SIX-FOOT METAL PLANER FOR SALE—practically new. Apply A. Graham Boyd, 100 Front St. E., Toronto. (14)

TWO FOX TURRET LATHES FOR SALE—splendid condition. Ideal Foundry, 910 Gerrard St. East, Toronto. Phone Gerrard 1055. (15)

1—2-SPINDLE SHAPER, WOOD TOP, JOHN Ballantyne, Preston, make. used two months. 1 Dynamo, 45 lights, Toronto and Hamilton Electric Co. make. Used five months. Good as new. Box 195, Jordon, Ont. (R.T.F.)

FORD-SMITH NO. 2 PLAIN MILLING MAchine: new: in perfect condition: ready for immediate shipment. McGregor & McIntyre, Ltd., 1139 Shaw St., Toronto. (16)

FOR SALE—FIFTEEN HUNDRED GALLON Duplex Steam Pump, used sixty days. Size twenty x twelve x sixteen stroke. Apply Fraser & Chalmers of Canada, Limited, Montreal. (12)

FOR SALE—GARAGE IN GOOD WHEAT district. Snap for a good, practical man. About forty cars in vicinity. Will sell cheap if taken at once. Address Box 74, Hanley, Sask. (13)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London. Ont.

FOR SALE OR TO EXCHANGE FOR A smaller tool—Bertram gap lathe, 16-ft. bed, swing 40 inches in gap, two face plates, one 4-jaw chuck, one steady rest, one turret head, and countershaft. All in first-class condition. Offered at a big reduction. Shipment could be made in ten days. Box 182, Canadian Machinery.

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double bandsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

ELECTRODES — THE PROPRIETORS OF letters patent No. 127080, relating to "Process of manufacturing iron for use in alkaline accumulators," and No. 127081, relating to "Active masses for positive electrodes of electric elements, etc.," desire to dispose of the patents or to grant licenses to interested parties at reasonable terms, with a view to the adequate working of the patents in Canada. Inquiries to be addressed to the actual proprietors, Svenska Ackumulator Aktiebolaget Jungner, Stockholm, Sweden. (13)

MACHINES AND TOOLS FOR SALE

One No. 3 Le Blond Miller, with all modern attachments, complete.

One handy lathe, 10 x 18 in.

One under draft latest improved Buffalo forge. (These tools are practically as good as new.)

Also a number of other lathes and drill presses.

Apply MEYER BROS.,
110 Adelaide Street East, Toronto
(17)

FOR SALE—1 CLEVELAND ACME MAchine Co.'s 6" Cap. Single Head, Tapping Machine—back-geared, automatic feed, cone step pulleys and countershaft with two extra chucks. Particulars from Taylor-Forbes Company, Limited, Guelph, Ont. (13)

FOR SALE, AT A SACRIFICE—SAW MILL outfit, A1 condition; 50 H.P. stationary boiler, 45 H.P. "Leonard" engine, "Green" carriage, Simonds saw, edger, planer, lathmill, etc. Easy terms. Write quick. R. Parker & Sons, Uno Park, Ont. (12)

FOR SALE—2-PHASE INDUCTION MOTORS, 1 only WESTINGHOUSE, Type C, 50 H.P.; 1 only WESTINGHOUSE, Type CCL, 50 H.P.; 1 only CANADIAN GENERAL, type 10, 20 H.P. In excellent condition. Prices attractive. Full particulars on application. Cummer-Dowswell, Limited, Hamilton, Ont.

FOR SALE—PLANING MILL AND FACTory, doing good business. Terms $2,000.00 cash. Balance to suit buyer. Address O. Ribble, Bronte, Ont. (13)

AUTOMOBILE BUSINESS AND NEW Garage for sale. Overland agency; lots of repairing; also Overland roadster, new tires, $300.00; 10 light D.C. generator, $25.00; K.W. magneto (new), $15.00. W. E. Hawes, Otterville, Ont. (13)

AGENTS WANTED

BRITISH HOUSE MAKING SYRINGES AND spraying machines for every possible use, need Canadian agents. The line is the most complete in the world and includes knapsack and ordinary spraying machines for fruit growers, limewashing machines for farms, factories, etc. Disinfecting machines for all purposes. Anything in the way of spraying and washing machines made to suit the market. Agents must be aggressive and ready to work the line thoroughly. Write: Spraying Machines, c|o Canadian Machinery, 143 University Avenue, Toronto.

SITUATIONS VACANT

WANTED—YOUNG MAN TO HANDLE ADvertising of a line of engineering equipment. Must be prepared to locate in a city of 15,000 population. Salary to start, $70 per month. Box 184, Canadian Machinery.

WANTED — MACHINISTS AND FLOOR hands on heavy and miscellaneous medium work; steady employment, modern shop, good wages. Apply, stating age and experience, P.O. Box 6, Walkerville, Ontario. (6)

WANTED

Burned out Tungsten Lamps, late type, drawn wire, 25, 40, 60 and 100 Watts, 110 and 115 volts.

DOMINION TUNGSTEN LAMP FACTORY
ST. CATHARINES, ONTARIO

WANTED

WANTED TO RENT — SMALL MACHINE shop, two or three small lathes, miller, drill, motor, furnace, usual small tools. Full particulars and terms. Box 179, Canadian Machinery. (13)

WANTED — TWO FIRST-CLASS STEEL moulders. Apply Nova Scotia Steel & Coal Company, Limited, Sydney Mines, N.S. (15)

WANTED—OUTSIDE MACHINIST TO ACT as mechanical foreman on construction work. Apply to A. B., Canadian Machinery. (15)

WANTED — YOUNG CHEMIST WHO HAS had some experience in analysis of iron, steel and other steel plant products. Apply to X. Y., Canadian Machinery. (15)

SITUATIONS WANTED

MECHANICAL SUPERINTENDENT, EFFICIency engineer and master mechanic having twenty years' experience in all lines of general machine, blacksmith, carpenter and pattern shop practice, foundry work, power plant, refrigerating and electrical engineering, is open for engagement. Box 177, Canadian Machinery. (11)

CHIEF ENGINEER — 26 YEARS' EXPERIence. Factory and Central Station, Alternating and Direct Current, Gas or Steam Engines. efficiency guaranteed, own instruments, best of references. Box 181, Canadian Machinery. (12)

AS MAINTENANCE ENGINEER OF FACTory, power or lighting plant, where economy is a factor, wide experience, best of references. Box 180, Canadian Machinery. (12)

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, APRIL 13, 1916 No. 15

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

The Installation and Maintenance of Transmission Belts

Staff Article

No part of plant equipment repays so highly the labor expended on it as does power transmission belting. The manner in which it continues to discharge its duty in spite of neglect and abuse indicates to some slight extent the degree of efficiency and economy which would be obtained with proper care and attention. Belting suffers silently and never drops till it is dead; with care and attention its life would be long and its service more satisfactory.

TO obtain, and maintain, the highest possible efficiency in power transmission, has been, and still is, an unsolved problem. Many substitutes for leather belt transmission have been devised, and have met with varying degrees of success, but nothing has as yet been produced, that for general, allround purposes can oust leather belting from the leading position. If the question of belt-driving is given equal consideration with many other forms of transmission, it will demonstrate beyond question its greater efficiency and economy. Wherever practicable the care of all belting should be under the supervision of one man. When this work is left to each individual machine operator the efficiency of belting becomes a minus factor. With the problem in the hands of one capable man there is the assurance that experience will evolve ways and means to obtain the maximum efficiency from the belts under his charge.

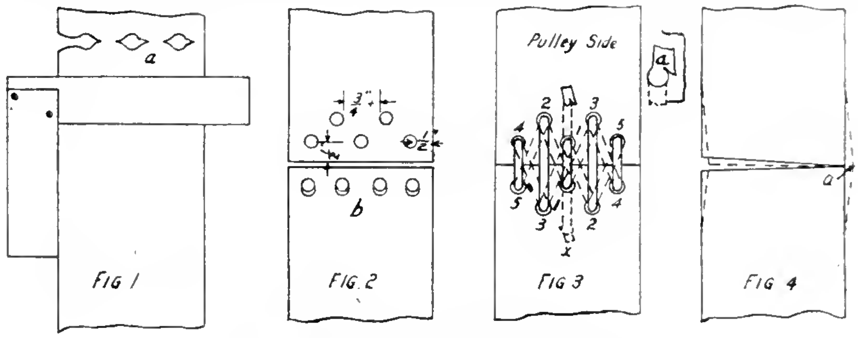
In the following article several details in connection with the use and abuse of belts and pulleys are set forth which may be profitable to those having the care and handling of belts and accessories.

Trimming and Punching Holes

When trimming a belt preparatory to lacing, always have the ends cut perfectly square; the proper joining of the ends of a belt is a question of paramount importance, and satisfactory operation is largely dependent upon the manner in which this work is performed. The correct way is to mark off the belt by means of a try-square, as shown in Fig. 1. By this method there is assurance of an even joint which will be free from any irregularity as it passes over the pulleys.

If proper attention is overlooked in this connection there is a possibility of producing a point similar to that shown by the dotted lines in Fig. 4. When this bulge (a) reaches the pulley, the tendency is to run off—or in the case of cone pulleys—to climb to the next higher step.

One of the most important factors in connection with efficient belt service is the proper use of the belt punch. By closely observing an old and worn joint it will be noticed that the holes have a shape similar to that shown at (a) Fig. 1. This shows that the tension of the lace causes rupture, through the holes, "across" the belt; very seldom will the lace pull out through the end of the belt. Therefore, it is advisable to provide plenty of space between the holes; good practice under general conditions would be an allowance of at least $\frac{1}{2}$ inch between the end and the holes, and a similar amount on each edge, with from $\frac{3}{4}$ inch to 1 inch between the holes; if it is necessary for a double row of holes the second row should be about $\frac{3}{4}$ inch back of the first row.



TRIMMING AND LACING THE BELT.

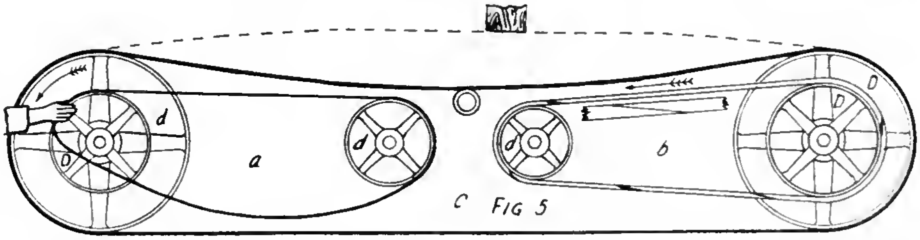
In the advent of an extra heavy lace being used it sometimes becomes necessary to enlarge the holes. From the above it is evident that the enlargement should extend lengthwise of the belt, as shown at (b), Fig. 2. Never use a punch larger than absolutely necessary, as every additional bit of stock removed only weakens the belt. The selection of a suitable lace should be given careful consideration. A thin strong lace is to be preferred to a heavier one of the same strength, as in the majority of cases it is the belt that breaks through the holes before the lace is broken.

Lacing the Belt

Numerous methods are used for the joining of transmission belts, but the one generally adopted, and the most satisfactory, is that of leather lacings. Many rules have been formulated for the lacing of belts; in fact, is would appear that every other mechanic has a different process. However, the course usually followed is shown in Fig. 3.

It might be stated here that the generally accepted rule is to run the hair or smooth side of the belt on the pulley. This, however, is an open question, as experts seem to differ on the subject.

When lacing a belt, it is always advisable to keep the lace on the inside parallel with the travel of the belt. To attain this proceed as follows: Insert the lace as shown in the two centre holes 1 and 1, keeping the straight portion on the side that is intended to run on the pulleys. With the ends of the lace of equal length, proceed as indicated in Fig. 3, working from each side simultaneously, 1-2-3-4-5-4-5-2-3-1-x. The hole x should be a tight fit for the lace, and when the lace is finally drawn through x, it should be notched and cut, as shown at (a). This, when properly done, acts as a good reliable lock for the lace ends. The use of knots is often resorted to, but is gradually being discontinued. When the joint is completed it may be slightly pounded with a wooden mallet, to flatten the lace before placing the belt on the pulleys.



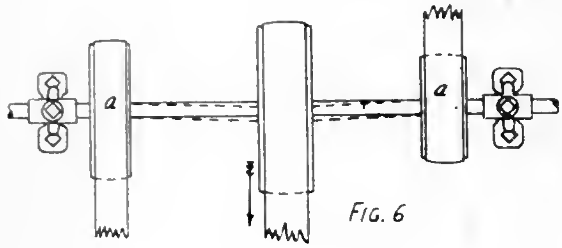
DIRECTION OF BELT TRAVEL AND PULL. PLACING BELTS ON THE PULLEYS.

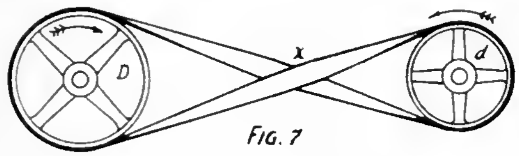
Direction of Travel and Pull

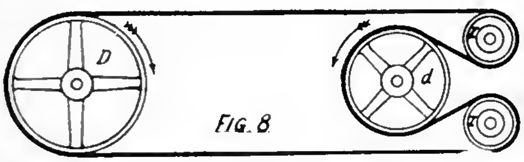
As leather belts are made of short

sections, joined together with a long wedge-shaped cemented splice, it is sometimes deemed wise to place the belt on the pulleys, so that this splice will lie as shown at (b). Fig. 5.

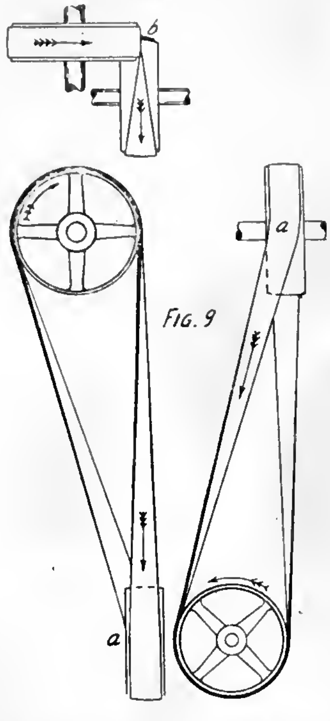
When dampness or other causes affect this joint so that the cement begins to slacken up, the thin end of the joint shows a tendency to curl, and by placing the belt as shown this trouble can be largely prevented, the action of the belt travel helping to keep the thin edge rolled down.



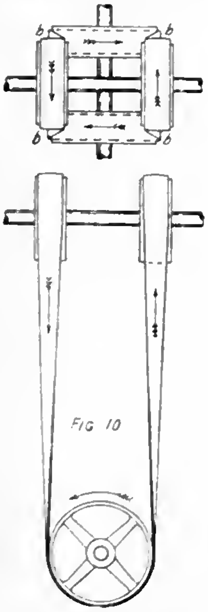




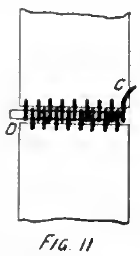
SHAFT SPRING, CROSSED BELT, AND CHANGE OF ROTATION DIAGRAM.

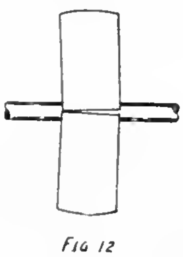


QUARTER TURN BELT ARRANGEMENT, TWO PULLEYS.



QUARTER TURN BELT ARRANGEMENT, FOUR PULLEYS.





METAL JOINTS AND WOODEN PULLEY TROUBLE.

When putting on a belt always place it over the dead—or, in other words, the driven pulley first; then from the back of the driving pulley D, the belt can be drawn on with the hand, as shown at (a) Fig. 5. Under no conditions should a person stand between the driving and the driven pulleys when putting on a belt. Some men advocate the use of a stick for this purpose, and in the hands of an experienced person it may have its advantages, but unless great care is exercised in handling the same, the risk of injury from the stick being caught will be as great, if not greater, than the use of the hand method. Where the belt is exceedingly tight, or long and heavy, it is best to shut off the power and perform the operation at very slow speed.

To derive a maximum amount of power from a belt drive the pull should come upon the lower portion of the belt, as by so doing the slack will sag on the upper half, giving increased belt contact on the pulleys. It is also advisable that wherever possible the direction of pull should be evenly distributed along a line of shafting. From this it is clear that with a main line operating numerous counter shafts on each side (with open belts) the slack of the belts on one side will be on the top and those on the opposite side will show sag on the lower portion.

Belts Too Slack or Too Tight

There are those who advocate a very slack belt with plenty of belt dressing, but under ordinary conditions it is not profitable to run a belt either too slack or too tight. A very slack belt will have a tendency to slip or flop when sudden loads are applied, and an extremely tight belt will cause undue strain upon the shafts and bearings. This is emphasized when the pulley is midway between supports, as shown in Fig. 6; the dotted line showing an exaggerated condition under such circumstances.

Driving pulleys for heavy duty, or when subjected to sudden loads, should always be placed as close to a hanger as possible, as shown at (a) Fig. 6.

When the slack of a belt is subjected to continual flop or oscillation, care should be taken that no pipes, beams or other obstructions come in contact with the belt, as the constant rubbing, or striking will in time destroy the belt and cut the lacings.

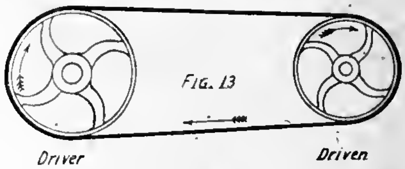
Changing Direction of Rotation of Parallel Shafts

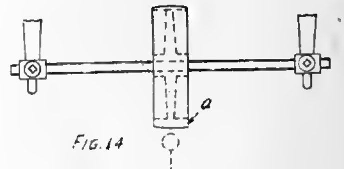
Where it is necessary to change the direction of rotation of two parallel shafts, crossed belts are used, as shown in Fig. 7. It is advisable that the rubbing faces at (x) should be the inside or pulley side of the belt, as the laces on this side are smoother and not so liable to wear as the outer parts of the lace. When the load is applied, crossed belts will often show a tendency to run off the pulley: this can sometimes be remedied by twisting the belt in the opposite direction.

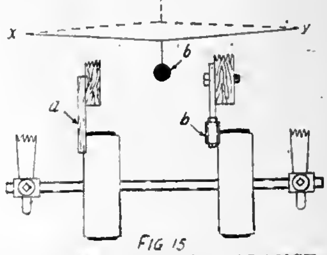
A change of rotation may be obtained by the method shown in Fig. 8 by the use of two idlers, I-I. This, however, necessitates the belt running on both sides.

Quarter-Turn Drive

Where it is desired to drive a shaft at right angles to another shaft various methods have been adopted; but the one generally used is that shown in Fig. 9. The principal objection to this drive is the constant fibre strain set up in the belt, due to the angle formed as it leaves the pulley at the points (a, a), also the fact that the rotation is only possible in



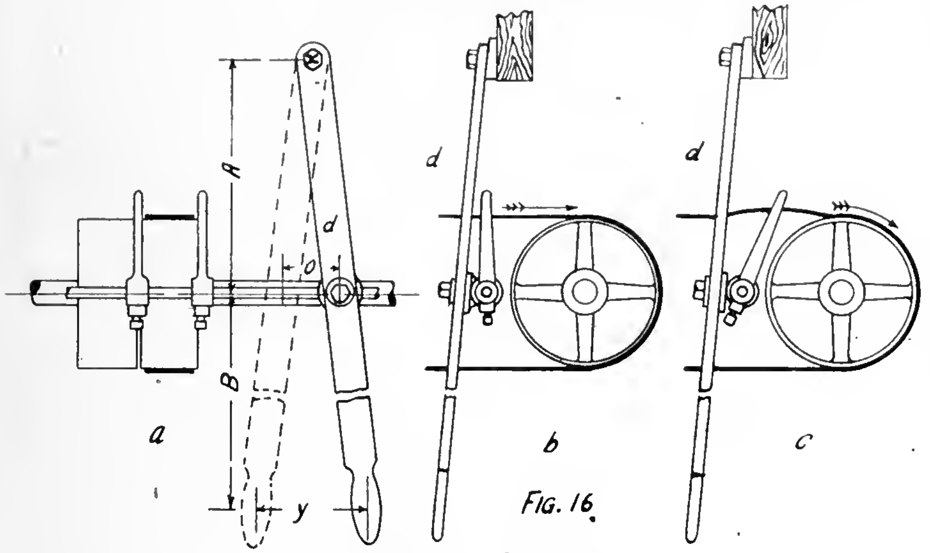




CURVED ARM PULLEYS, BALANCE OF PULLEYS AND BELT GUIDES.

one direction (that indicated by the arrows). The chief consideration in laying out a quarter twist drive is that the points (a, a) where the belt leaves the pulleys should lie in the same vertical line, as shown at (b). This rule also applies to all angular horizontal drives.

Another method of quarter-turn drive, involving the application of four pulleys, is shown in Fig. 10. The same principle applies in this case as that shown in Fig. 9, viz., the point where the belt leaves the pulleys should be in the same vertical line. It will, however, be noticed that in this figure the belt can be run in either direction. It will also be observed that the two pulleys on the one shaft are travelling in opposite directions, which indicates that one will be a driving pulley and the other will be an idler or loose pulley, which is kept in position with collars (not shown) secured to the shaft. The speed of the loose pulley, in relation to the shaft will therefore, be twice that of the driving pulley, when pulleys are of the same diameter.



BELT SHIFTER TROUBLES.

Metal Joints

During the past few years many forms of metal joints and wire lacing have been designed and adopted; but while they may be highly recommended for certain purposes, they should not be used where necessity arises to shift a belt by hand. Experience has shown that joints of this description, after becoming somewhat worn will allow the metal or frayed wire, and often the raw hide pin, to protrude as shown at c and d, Fig. 11: this condition sometimes proving injurious to the machine operator.

A common cause of belt trouble is that shown in Fig. 12, where a wooden pulley hangs crooked on the shaft, owing to one side being tightened up more than the other. This fault should be remedied as early as possible.

Belt Guides

Where belts acquire a habit of continually slipping off on one side of a pulley, when taking up a load, it is a common practice to put up a temporary guide, in the shape of a stick nailed to a joist, as shown at (a) Fig. 15. This in many instances proves to be a permanent fixture, which in time will materially affect the life of the belt as the constant friction will ultimately fray or curl the edge. If it seems necessary to construct a guide for this purpose the method shown at (b) is suggested. This is a roller running on a rod, which is secured to the beam above. By this means the friction is considerably reduced by the rolling action; and the effect on the belt is less harmful.

While contrivances of this nature reduce the trouble of belts slipping off to a large extent, the general adoption of such methods should not be encouraged, as the advantages derived are not sufficient to counteract the loss sustained through belt depreciation.

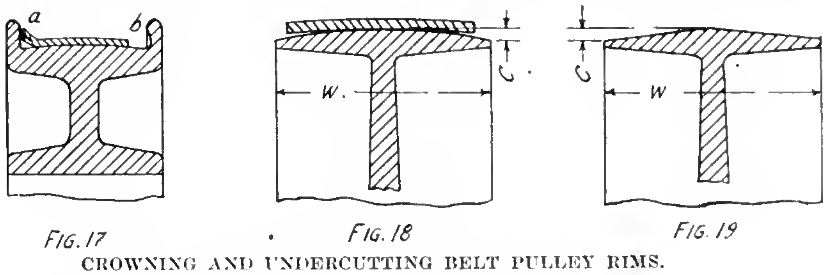


FIG. 17 FIG. 18 FIG. 19
CROWNING AND UNDERCUTTING BELT PULLEY RIMS.

The source of the trouble should be located as early as possible, and steps taken to eliminate it. This will likely be traced to shafts out of line, too great or insufficient crown, pulleys out of line, faulty belts, etc., or a combination of one or more of the above.

Balancing of Pulleys

When shafting is running at high speed, more attention is required in the balancing of pulleys. This, at first sight, seems a question of minor importance, but if the speed is excessive and the pulley of fairly large diameter, any irregularity in the mass of the metal will have a corresponding effect upon the shafts and bearings. The centrifugal force of the revolving pulley will cause the heavy section (a) Fig. 14, to swing farther from the centre of motion. This action can be more clearly illustrated by referring to the lower sketch, where the unbalanced weight is represented by a ball on a cord. By revolving the cord x-y at high speed, the centrifugal force set up will cause the cord x-y to be distorted from a straight line; the position taken up being represented by the dotted line. This lack of balance is often the cause of "sprung" shafts. It is therefore necessary, that high speed pulleys be properly balanced before being placed on the shaft. The most frequent method of balancing fly-wheels or pulleys is with the horizontal straight edge. This is very satisfactory where the speed is below the average; but when the speed is great, this method may not be reliable. For instance, a pulley may be found to be out of balance from excessive metal at the lower or hub end of one of the arms; metal is applied by the welding process to the rim end of the opposite arm, sufficient to show perfect balance on the straight edges. When the pulley is placed on the revolving shaft the speed will cause the pulley to be out of balance, but in the opposite direction to the original test. This is owing to the added metal being placed at a greater distance from the centre of motion.

When pulleys with curved arms are being used it is always advisable to have the curve face in the direction of the pull as shown in Fig. 13, so that the metal in the arms will be under compression. This method increases the limit of power which the pulley can transmit.

Belt Shifter Trouble

Trouble is often experienced from a belt creeping from the loose to the tight pulley of the machine counter-shaft. The source of this annoyance is usually found in the belt shifting apparatus. In Fig. 16 is shown a partial front and two side views of a belt shifting arrangement. If the shifting lever (a) travels much past the centre line of

action x-y, the force of gravity will tend to bring the stick back to a vertical position, especially if the parts move freely.

To overcome this trouble the connections should be sufficiently tightened to avoid free movement, and where possible the distances A and B should be so proportioned that the movement (y) is no greater than what is necessary.

When placing the forks on the shift rod they should be secured in the position shown in (b) Fig. 16, at right angle to the travel of the belt. If secured at an angle, as shown at (c), the force exerted to move the belt will cause the edges of the belt to curl up as they come in contact with the inclined fork.

Crowning and Undercutting

The trouble met with in cases such as that of Fig. 15, may be also experienced with cone or flanged pulleys.

In Fig. 17 is shown a small flanged pulley with the belt climbing the face of the flange (a). This may be due to the causes previously mentioned or from an accumulation of dirt or belt dressing on the inner face of the flange. These flanges, and also the faces of cone pulleys should be undercut as shown at (b). When this is done the belt is only in contact at the edges where it enters and leaves the pulley.

Where belts are constantly run in the one position, it is advisable to crown the face of the pulley, as a belt under normal conditions will always run to the high point, and if this point is in the middle of the face the belt will retain a centre position on the pulley. However, there is a limit to the advantages derived from this process, for, if the convexity is too great the lack of flexibility in the belt will materially affect the contact on the face of the pulley, as shown in Fig. 18. The general rule for the crowning of pulleys is about ¼ inch to the foot of width, or $C = \frac{W}{48}$. This crown should have the shape of the section of a sphere as in Fig. 18, but in some cases two frustums of cones are formed as shown in Fig. 19.

It might be said in conclusion, that too much attention cannot be given to the proper care of belts and pulleys, as the efficient operation is often seriously affected by careless and inexperienced handling of this part of machine shop equipment.

CONCRETE FLOORS FOR WORKSHOPS

CONCRETE makes a cheap floor for a workshop, but in many cases its efficiency is often spoiled through its getting cracked after some little time, and eventually more or less broken up. As the cause of this is not generally understood, the following remarks by B. Davis, H.M. Inspector of Factories for the Kent district, may be of interest. He remarks that in addition to the obvious reasons that builders often use too much sand in proportion to the cement, and have an insufficient thickness on bad foundations, there are others due to ignorance when the intention is good. Mixtures of sand and cement expand when they are wet, and contract as they dry, and within limits the greater the proportion of cement the greater the expansion and contraction.

A common practice is to put down a first layer of material with a small proportion of cement, to let this dry, and then put on top of it a thin layer with a large proportion of cement. This top part thus remains a separate layer instead of bonding with the lower part, as it would have done had it been put on at once on the still unset lower portion, while, being richer in cement, it expands and contracts more than the lower part, with the result that it may be rapidly broken up. For large surfaces, however good the workmanship and material, the expansion and contraction are almost certain to produce cracking unless the job is divided up vertically into sections with thin strips of wood between them.

PRESERVATION OF IRON PATTERNS

A METHOD of preserving iron patterns from rust and corrosion is first to subject them to an air blast to remove dirt and dust, and then to immerse them in a pickle composed of 5 gallons of water and 1 pint of sulphuric acid. This is used hot, and the patterns are allowed to remain in it for 5 min. The patterns are then rinsed in water and dipped into a hot potash solution made by dissolving 1 lb. of potash in 1 gallon of water, thus neutralizing the acid left in the pores of the iron. The patterns are allowed to remain in the solution for about 5 min., and are then scoured with a stiff brush to remove the rust and again dipped into the sulphuric acid for a minute or so. They are then rinsed in cold water and not allowed to dry, afterwards being immersed in a weak cyanide of potassium solution made by dissolving 2 oz. of the cyanide in 1 gallon of water. Copper plating takes place in the regular cyanide copper-plating solution used by all electroplaters. The solution is used hot, and the deposit need not be thick, the time necessary being usually from 5 to 10 mins.

The next step is to rinse and dry the patterns, after which they are warmed and paraffin wax rubbed over the surface as a thin coating. When cool, the surface is brushed with a bristle brush in order to smooth down and even up the paraffin coating. They are then ready for use. The paraffin protects the copper from corrosion and allows the pattern to leave the sand easily.

CANADIAN RAILROAD DE . MENT

THE annual railway statistics blue book, tabled in Parliament at Ottawa, on April 4, shows that, despite the war, an addition of 4,787 miles was made to the operating mileage of Canadian roads during the year ended June 30 last. The greatest increase was in the Provinces of Ontario and British Columbia.

Ontaria has still a railway mileage more than double that of any other Province, with 10,708 miles in operation. Canadian lines in the United States have a total mileage of 3988.

An increase of $66,990,127 in railway capitalization for 1915 brought the total up to $1,875,810,888. Dividends on stocks amounted to $32,341,337, as compared with $30,434,601 for 1914. Government-owned and operated lines which are not capitalized showed a cost of $293,542,201.

Cash subsidies amounted to $5,059,284, of which the Dominion contributed $4,644,664 and the Provinces $414,020. The whole account for aid in cash, constructed lines, loans, etc., stands at $238,831,924. Land grants have totalled 43,929,312 acres, and guarantees have been authorized amounting to $409,869,165.

There were 46,322,035 passengers carried in 1915, and 87,204,838 tons of freight; this was a decrease of 380,245 passengers and 14,189,151 tons of freight.

Gross earnings fell from $243,083,539 in 1914 to $199,843,072 in 1915. Both passenger and freight decreased, but operating expenses also decreased and the aggregate was equal to 73.9 per cent. of the gross earnings.

Although there were increases of motive power and of cars for passenger service, there was an actual decrease of 2,500 in the number of cars available for freight service. The railways took advantage of the conditions to take out of operation a considerable number of old and much-worn cars. The number of employees was reduced from 159,148 to 124,142. Salaries also declined by more than twenty millions.

Railway operations resulted in 384 persons being killed and 3,161 injured. Only seventeen of the killed were passengers.

Copper Production in B.C.—The Hon. Lorne Campbell, Minister of Mines for British Columbia has stated that 100,000,000 pounds of copper valued at $20,000,000 would be produced at the Granby Britannia and other mines on the coast every year in the near future.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

GAUGES IN MODERN MANUFACTURING PRACTICE—II.

By F. H. Mayoh.

WHILE those referred to above are termed standard types, and are such, inasmuch as they can be bought from most any dealer, there are others which are equally as important in specialized manufacturing practice. Some of these

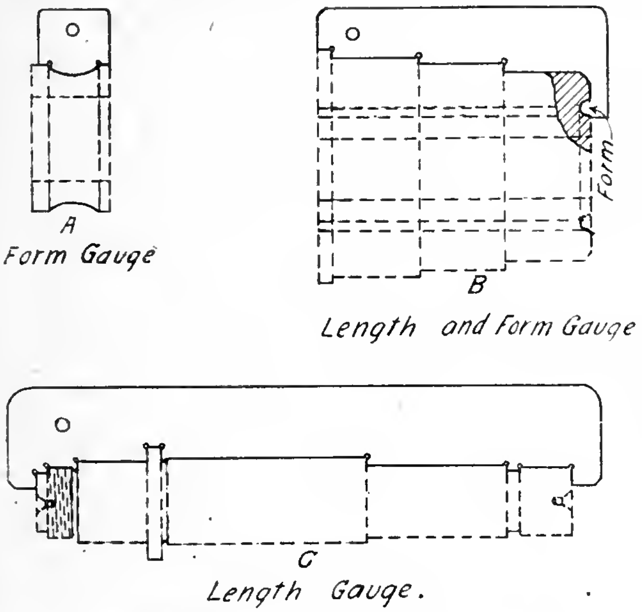


FIG. 5. SIMPLE TYPES OF SPECIAL GAUGES.

are the length and form gauges, Fig. 5, made in various forms and lengths for gauging work similar to that shown being gauged at A, B and C.

Length Gauges

Another style of gauge, which is also a length gauge, is shown in Fig. 6, and consists of a bar A, a head B, and a scratcher C. In this tool the scratcher C is held on the end of the bar by means of the screw D, while the head B slides on the bar and is adjustable to different lengths. It is used for scratching lines

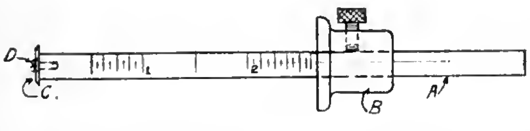


FIG. 6. ADJUSTABLE SCRATCH GAUGE FOR MARKING OFF.

on sheet metal or other parts similar to those shown at A and B, Fig. 7, and numerous other purposes. Again referring to Fig. 7, the dot and dash lines at A were drawn by this scratch gauge, and at B the scratcher is shown in position for drawing a line.

Gauging the relation of a hole to the end of the piece is quite often done by means of a plug and bar gauge, Fig. 8, where the plug A fits into the hole and distance from the end is measured by the plug B which has two diameters machined on it to correspond to the limits of length allowed the small diameter to go past the end and the large diameter not to go. Similar gauges to these are often used for gauging the relative distance between two or more holes.

Valve Seat Gauge

To measure a valve seat, a gauge similar to Fig. 9, is often used which slips over the shank on the valve and gauges the seat by means of the step A, which indicates whether the bevel is the correct length by requiring that the seat of the valve B come between the step A, when the seat has been machined correct.

Taper Gauges

Three taper gauges are shown by Fig. 10, consisting of a plug taper gauge which shows both the amount and diameter of the taper the first by placing a chalk line or Prussian blue along the plug and wringing it into the taper hole when by removing the same if the hole has the right taper all the chalk will be removed while if not correct the chalk will be removed in spots. Secondly the ring B is for measuring the outside taper on a piece in the same man-

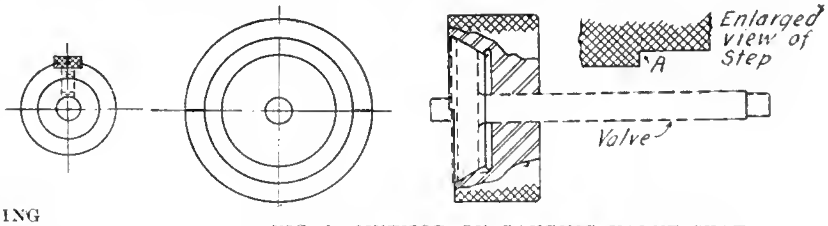


FIG. 9. METHOD OF GAUGING VALVE SEAT.

ner as when using the plug, while lines on the plug (a) and the step on the ring (b) indicate whether the diameter is within the required limits.

The third gauge C is a transfer gauge meaning that a taper plug is placed between the jaws (d^1) and the jaws set to conform to the taper of the plug. When

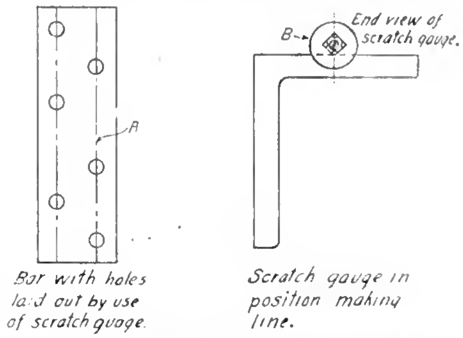


FIG. 7. METHOD OF USING GAUGE.

by taking the plug out and trying the pieces being machined between the jaws it can be seen whether the taper is cor-

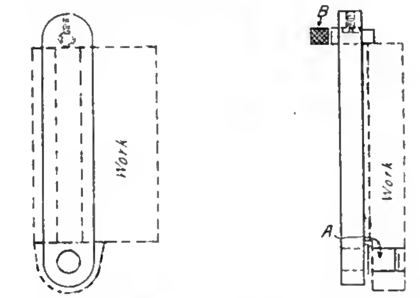


FIG. 8. GAUGE FOR TESTING RELATION OF HOLE TO END OF WORK.

rect or not. This gauge is not limited to one taper but can be set for various tapers.

Button Gauges

The use of buttons for gauging is another important consideration and two illustrations showing their application are given in Fig. 11, where the upper one is shown measuring an angular dimension from a pin. In this case the hole A is first located, bored, and a pin placed in this hole, following which the holes B and C are bored as follows: The centres for these holes are first located approximately by measuring with a scale in the usual manner and drilling a small hole for a screw. The next step is to place a bushing or button in position, when, by measuring from the pin

to the buttons and also between the buttons as indicated. D, E and F are obtained, these distances being equal to the centre distances minus the radius of the pin and buttons. The buttons can be clamped by the screws in the correct locations when by proceeding as shown in the lower view the holes may be bored. The procedure for boring a hole accurately by the button method is to set the work up true in a lathe by means of a test indicator (X) which multiplies any errors, the manner of using being obvious from the illustration.

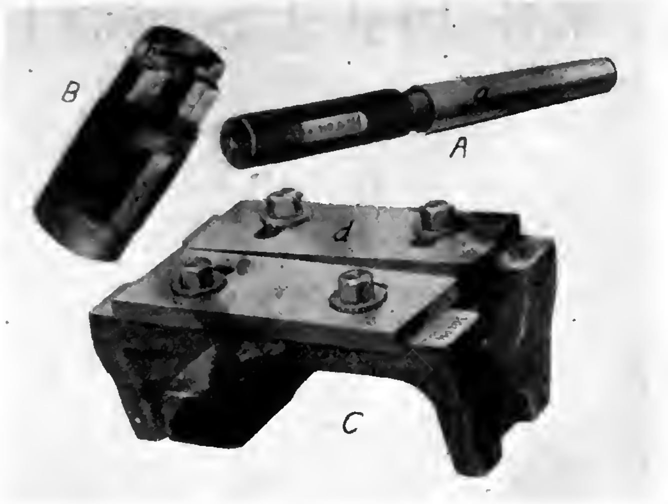


FIG. 10. A TAPER RING GAUGE.

Another button method of measuring is known as the Sine Bar Method, and this is used for measuring tapers, the idea being that by measuring the differences between the position of the pins at each end of the bar A when set in a holder B, Fig. 12, the taper can be computed, the work to be measured being tested between the two surfaces in the usual manner of using a protractor.

POWER ABSORBED BY SHAFTING

IN the course of a paper on "Modernization of Power Plant in Factories," read before the Junior Institution of Engineers, W. A. Tookey said that during recent years he has had a number of opportunities of determining the amount of power absorbed by shafting and belts in factories, and it will be seen from the list given in the accompanying table, taken indiscriminately from his records, that in many instances the proportion of power thus accounted for of the normal output from the engines concerned is extremely high.

Power Absorbed by Shafting in Small Factories

This is not remarkable, having regard to the conditions which obtain in the majority of factories when the shafting is erected as cheaply as possible, of as light a character as will just do the work, and supported on bearings at wide intervals, which in their turn are often bolted to insubstantial structures. Pulleys are frequently as small as parsimony dictates, so that with heavily-stressed belts anything like ideal efficiency cannot be approached. It will be evident that the dust rising from grinding and woodworking plants greatly increases the proportionate "shafting loads."

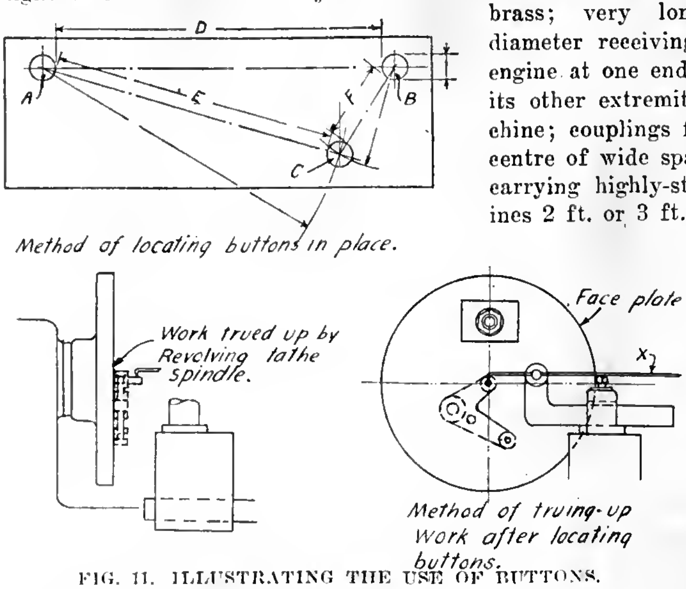


FIG. 11. ILLUSTRATING THE USE OF BUTTONS.

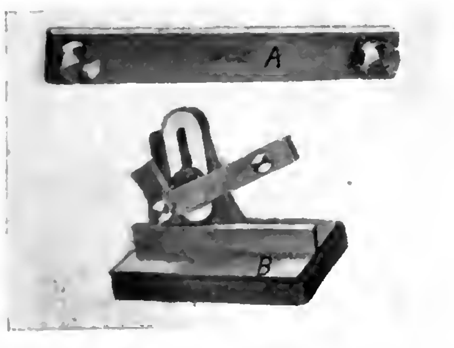


FIG. 12. METHOD OF MEASURING TAPERS WITH SINE BAR. B—DIFFERENCE IN HEIGHT OF PINS FROM BASE DETERMINES TAPERS.

There is probably no need to remind engineers of the circumstances under which shafting and belts operate, says Vulcan. From the time that the shop starts work in the morning until the engine is shut down at night there is no opportunity of doing much to the shafting in the way of adjustment, however badly it may require it, while it is only in cases of breakdown, actual or imminent, that any attention is, in fact, given to it.

Mr. Tookey said he had seen bearings that had been worn through the bottom brass; very long shafts of small diameter receiving the power from an engine at one end, and giving power at its other extremity to some heavy machine; couplings fitted to shafts in the centre of wide spans; and large pulleys carrying highly-stressed belts to machines 2 ft. or 3 ft., and sometimes more, from the nearest bearing. He had been able to count the speed of rotation of a shaft by noting the periodicity of its dog-leggedness, and had seen many instances of vibration being set up by a shaft fitted with unbalanced pulleys revolved at high speed.

Hull, Que.—The Hull Iron & Steel Co., will make an extension to their plant to cost about $4,500.

Test No.	Factory	Engine Power Normal h.h.p. A	Engine Power Max. h.h.p. B	Shafting and belt friction	Percentage on Col. A	Percentage on Col. B
1	Woodworking	7.3	25.0	1.0	13.7	4.0
2	Leather tannery	7.5	28.0	2.5	33.3	9.0
3	Asbestos products	38.0	47.0	15.5	40.0	33.0*
4	Woodworking	9.5	24.0	8.5	90.0	35.5
5	Woodworking	8.5	8.7	8.5	100.0	100.0†
6	Chaff cutting	...	4.75	0.4	....	8.5
7	Leather glazing	7.0	18.7	1.0	14.3	5.3
8	Printing	1.7	6.5	1.0	59.0	15.4
9	Baking	...	11.5	1.0	....	8.7
10	Chaff cutting	...	7.3	1.3	....	17.8
11	Grinding	41.0	41.0	24.5	60.0	60.0
12	Refrigerating	6.7	17.4	3.6	54.0	20.7
13	Paint mixing	...	18.0	2.0	....	11.0
14	Woodworking	...	12.0	2.5	....	21.0
15	Grinding	1.5	7.5	0.7	47.0	9.3
16	Grinding	55.0	70.0	30.0	54.0	43.0
17	Leather fleshing	12.0	30.7	5.5	45.8	17.9
18	Grinding	24.0	....	10.25	43.0	....
19	Ink grinding	14.5	25.0	2.0	13.8	8.0
20	Woodworking	10.0	23.0	5.0	50.0	21.6
21	Ironfounding	36.0	52.0	15.0	42.0	29.0
22	Woodworking	14.0	....	4.2	30.0	....
23	Woodworking	19.5	40.0	7.5	38.7	18.8
24	Machine tools	84.0	138.0	23.0	27.5	16.7
25	Machine tools	21 kw	90.0	11.0	35.0	12.2‡
26	Woodworking	30.5	38.0	10.5	34.5	27.6
27	Woodworking	26.6	34.5	13.0	49.0	37.5
28	Woodworking	14.5	20.0	3.5	24.0	17.5

*Four floors.

†Insubstantial supporting structure. A second engine coped with the "load," while this dealt with the shafting friction.

‡Electrical transmission and shafting.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

SEEING THE FINISHED JOB

By J. R. H.

AMONG the first things that a young man should acquire, when taking up a vocation, is the ability to perceive with the mind, the final accomplishment of the work he has in hand. The majority of industrial workers of to-day are content to plod along, seeing only with their eyes; their mind either asleep, or wandering in some other channels, foreign to that in which their present labors are engaged.

To successfully achieve anything worth while, the mind and hand should work in harmony, zealously striving to accomplish the end in view. No man can conscientiously perform his allotted duties unless he takes a special interest in every detail. Before a job is ever started, the workman should have a clear conception of the final appearance of the work under consideration. Much time and unnecessary labor is often saved by a little forethought; mental performance of each operation will sometimes eliminate considerable waste of effort, which is often experienced if the work is performed in a haphazard and impulsive manner.

Some years ago a new mechanic was hired by a certain engineering firm. The foreman gave him a large number of shafts to turn, told him to do a specific operation on all the shafts, and when he had that finished, he would tell what operation to do next. This went on, each series of operations being completed until the shafts were finished. It appears that this system had been going on for a long time in this particular shop, but experience had shown the new mechanic that a little thought applied to this job would result in completing the entire work in much less time. When the next batch of these shafts were given him, he understood what was required, and instead of going about it, as others had been doing, he had prepared a method of his own, by which the work was accomplished in one third less time.

What every young man should realize early in his career is that the man who thinks for himself is the one that in time will tower above his fellows. Remember, that while the eyes see only what you are doing, it is the mind that tells you what should, or should not, be done. I was once told that a machinist, when asked why he was doing work in a certain way, replied, "I don't know; ask the boss, I'm only working here." This answer might be true in the case of many men in workshops to-day; but it is also true that while you are working for your employer, you are nevertheless compiling the material that shall make or mar your future life and character.

A man should not only do his work but should study it. He should not be content with the simple knowledge of what he is doing, but should know why he is doing it. The mere fact that the work supports you should not be sufficient; you should support your work; take such an interest in it that the closing hour of the day will come as a surprise, and not as something that is only a relief from a tiresome and arduous task.

While you are at the machine or the bench; keep your mind on your work; not because you are expected to do so, but because it is a duty you owe to yourself. No man can afford to work, for another, if he is not first working for himself. Your present remuneration is for what you are doing; your future, for what you will have learned from the interest, or lack of interest, you are now taking in your daily labors.

Remember the past; study the present; think of the future; and acquire the ability of seeing with the mind's eye that which the hand will ultimately accomplish.

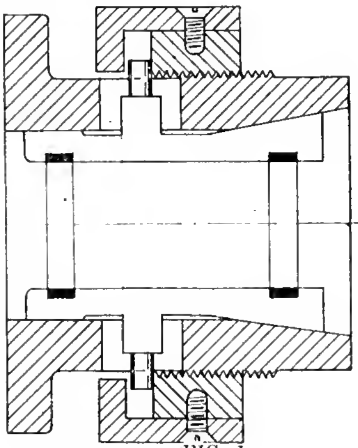


FIG. 1

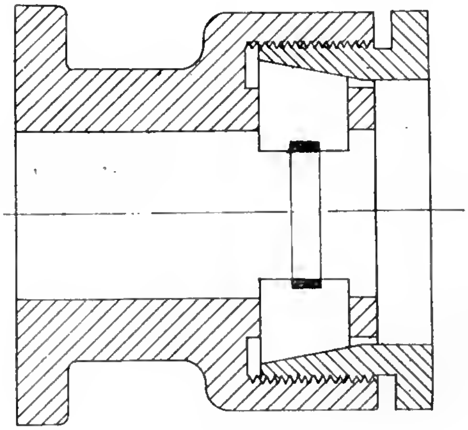


FIG. 2

SHELL MAKING TOOLS

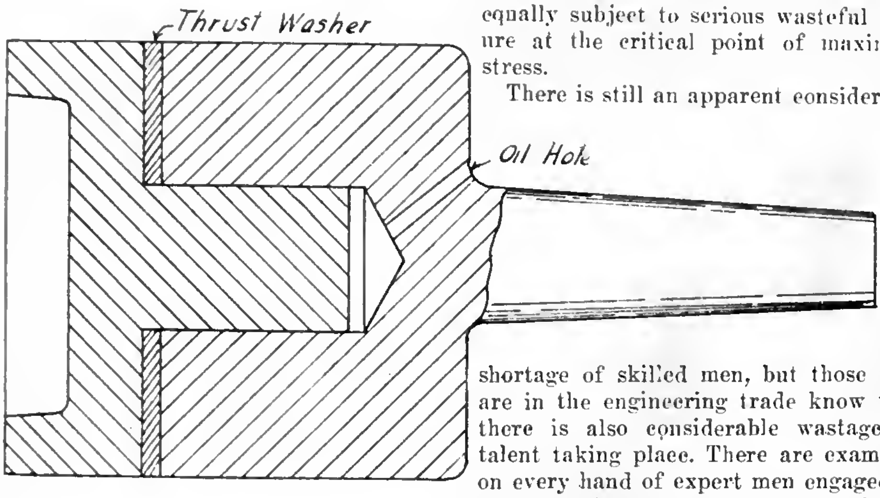
W. J. M.

THE writer has read several of your recent articles describing various items of shell equipment in use in British shell factories, and, while appreciating the interest which this information may have for your readers here in Canada, feels constrained to express the opinion that if the descriptions referred to are typical of British practice, then Canadian manufacturers need not take a back seat for all the munition makers in the world.

The items of equipment described on page 311 of your issue of April 6th prompted the writer to look up the English journal referred to and considerable surprise was felt when it was stated that the entire machine shop of the firm in question was occupied in making more than forty different types and sizes of special chucks and other tools for machining high explosive shells of 3.3 in. calibre and upwards.

Taking the collet chuck Fig 1, in your issue referred to, the design of this article may be alright on paper but in practice it would not be long till its action would become unreliable. The conical collet which compresses the jaws has only a very small bearing on the outside of the chuck to-day. This would have to be made an excellent fit to begin with, and unfortunately, the better the fit the quicker the wear. A degree of slackness is bound to occur through wear on the threads of the right and left hand nut, so that when any unevenness on the surface of the shell caused the jaws to impart a rocking motion to the collet ring the small bearing which it has on the chuck body would soon become inoperative, leaving the collet ring floating in the nut, and the nut floating on the chuck body. The amount of shake possible in this case would then be equal to the sum of the shake in the two threaded diameters, which with a little wear on the threads would soon be beyond the allowed limits of accuracy on the shell.

In the absence of full particulars of the type of lathe used, one presumes that the lathe spindle was solid thus preventing the adoption of a pot chuck with draw in collet actuated by a rod through the spindle such as is in common use on this side of the ocean, but the fact of a solid spindle would not have prevented the use of a draw-in collet chuck if inner ends of the seg-



ments had pins projecting through slots in chuck body to engage on as shown in sketch herewith Fig. 1. Collet chucks, however, are more suitable for use on finished surfaces and if, as is probable the British chuck in question was intended for use on rough forgings, it would be more satisfactory to use a tightening device of the type shown in Fig. 2. This allows the use of narrow jaws for gripping the rough surface of the forging and has the merit of all parts being solid metal to metal without any chance of shake. "The tighter the solider."

The adapter centre described is your article seems to be an unnecessary refinement in view of the satisfactory results obtained in this country with devices having half the number of parts. The designer evidently overlooked the fact that all shells have a considerable radius on the corner of the base, and a simple cup centre of the type shown in Fig. 3, may be found in 90 per cent. of Canadian shell shops on shells up to 6 in. calibre doing excellent service with equal degree of accuracy and a considerable saving of time over the British design referred to.

These are minor points in shell equipment, but their influence on quantity and quality may be quite considerable in the aggregate, and if we are to judge from such information as is available, the Canadian machinist has a lot to be proud of when it comes to shell machinery and devices.

THE THREE-SHIFT SYSTEM

THE extreme pressure imposed on all engaged in the production of munitions of war has compelled every engineering works manager to face extraordinary conditions. It is essential to extract every available ounce of work from men and plant. In this extremity there is always the risk of overdoing the speeding-up; men's physical constitutions and the strength of machines are both equally subject to serious wasteful failure at the critical point of maximum stress.

There is still an apparent considerable shortage of skilled men, but those who are in the engineering trade know that there is also considerable wastage of talent taking place. There are examples on every hand of expert men engaged in munition factories through long hours and working at semi-skilled tasks. They are inefficient in the sense that their class of work could be learned easily and be just as thoroughly done by recruits from the ranks of rough labor. It is in this connection that there is great need of practising labor efficiency, and every works manager should tackle this particular feature for himself in his own works.

There is every reason for giving the subject of shorter shifts for all workers serious attention, apart from the bearing it has upon woman labor. It has been proved beyond doubt that the present customary two shifts per 24-hour day imposes too much upon the worker's constitution. The frequent police court cases arising from laziness and lost time are evidence of the great wastage taking place daily throughout Britain in munition factories.

Two and Three-Shift Comparisons

An actual record of labor efficiency as affected by the duration of working shift is quoted by J. E. Grant in a recent issue of "Engineering." At a particular works the two-shift system was in vogue. This was made up of a day-shift extending from 7 a.m. to 5 p.m., with an hour break, and a night-shift extending from 6 p.m. to 7 a.m., with breaks of an hour and a half-hour. The week's total day-shift time was 50 hours; the night-shift total, 57½ hours. It was found that the output per man per hour on the night-shift was from 15 per cent. to 20 per cent. less than the output per man on the day-shift. It has always been accepted in engineering works that a night-shift cannot give the same rate of production as prevails on day work.

The particular merit of the case quoted by Mr. Grant is that he is able to give a direct comparison of the working of the two-shift and three-shift systems. The latter arrangement was introduced as follows:—First shift, 7.30 a.m. to 4 p.m.; second, 3.30 p.m. to 12 midnight; third, 11.30 p.m. to 8 a.m.; in each shift there was a half-hour break for meals. The total number of hours worked per week was thus increased from 107½ hours to 144 hours—and the efficiency or productive capacity of the machines increased proportionally.

Even more important was the great improvement of the workers' efficiency. It was found that each man in his 48-hour week was doing as much as he did before in his 50-hour day-shift week. The net result of the change has been an increase of 50 per cent. in output. The men are kept running at high pressure, without weariness, but always energetic and cheerful; they are always ready and willing to work on at overtime as occasion may demand. The overhead charges of the machinery are less, due to the increase in working hours. This increased working of the plant necessarily adds to the maintenance charge, but that is much more than offset by the all-round considerable gain in the efficiency of labor and machinery.

Records of actual experience such as this are invaluable to-day. They stand out prominently amongst the innumerable fantastic proposals and suggestions to meet the labor crisis, most of which have a political origin and are not economically practicable. — Manchester Courier.

POTASH AND FELDSPAR

DR. FRANK D. ADAMS, speaking at the recent annual meeting of the Commission of Conservation, said: "A question of great importance is whether we cannot find deposits of potash in Canada. It is practically impossible for us to find deposits of potash similar to the German ones, but, locked up in the rocks of the northern Laurentian country, where we have these great granites, we possess enormous deposits of silicate of potash and feldspar. These are now awaiting the arrival of some one who will invent a method to get supplies from the old granite rocks. Whenever that can be done we will have in the northern country an enormous and inexhaustible supply of potash."

The Port Hope Machine & File Works have taken over J. Helm's foundry and machine shop at Port Hope, Ont., and will conduct a general engineering business. Special machinery is being installed for re-cutting files, which will be the principal branch of the business.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

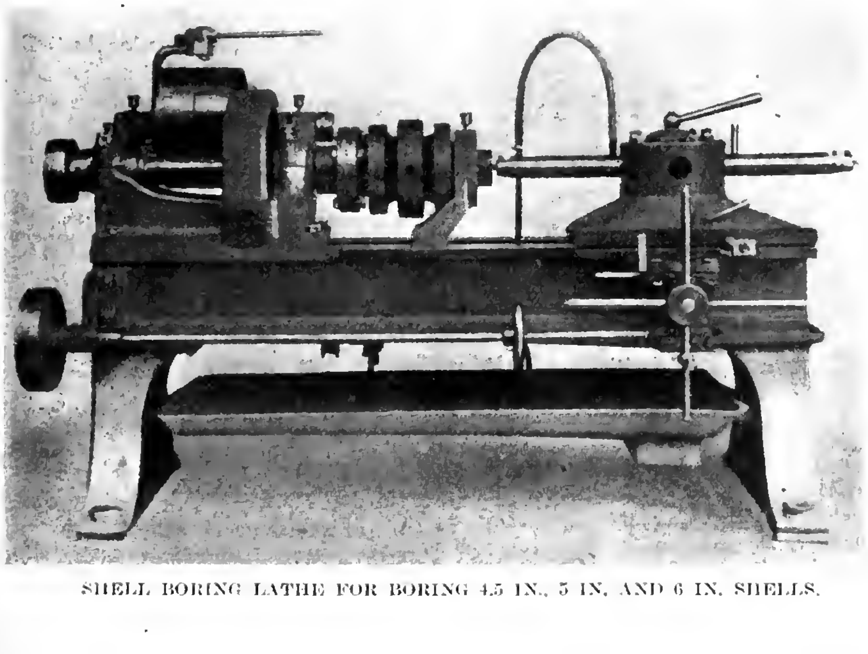
SHELL BORING LATHE

OUR illustration shows a 9-in. centre lathe, designed by the Hunslet Engine Co., Leeds, Eng., for boring 4.5 in., 5 in. and 6 in. shells. These lathes have been specially built for handiness, ease of manipulation and to stand rough usage by unskilled persons. The headstock is provided with a hollow spindle of high-tensile steel running in gun-metal bearings with large ball thrust washers, and is arranged for a single speed. The drive is by means of a fast-and-loose pulley on the back shaft, no countershaft being required. The back shaft bearings are of cast iron, lapped out, and the spindle bearings of Admiralty mixture gun-metal. The turret is of substantial construction, with wide bearing surfaces, and is supplied with four holes to receive the tool bars. The plunger and bushes of the turret stops are of steel hardened, and are ground so as to ensure that the turret may be brought correctly to centre for the different tool bars. The turret saddle is of unusual length and the projecting end passes under the chuck, which enables the turret to be brought close to the chuck.

The feed motion is arranged for one rate of feed only, and the shafts for the feed gear are covered by the saddle to prevent chips getting into and damaging the gears. The rack is arranged in the centre of the bed so as to give a central thrust to the slide, and the steel feed rack which actuates the turret slide is inverted so that chips are unable to enter. An automatic adjustable stop is fitted to the slide feed. The feed gears, with the exception of the worm wheel and clutch, are arranged inside the bed, but are easily accessible. They are forged solid, so as to eliminate shaft keys. The whole of the feed gear is made of high tensile forged steel. There are three feeds as follows:—Automatic fine hand and quick hand.

For shell boring the fine hand feed is necessary. The automatic feed is disengaged when the boring bar is nearing the bottom of the shell and the fine hand feed is then used for the bottom-forming operation. The following are the leading particulars of this lathe:

Height of centres, 9 in.; length of bed, 7 ft.; diameter of holes in turret, 2¾ in.; gear ratio, 5 to 1, 6½ to 1; diameter of driving pulleys, 1 ft. 3½ in.; width of driving pulleys, 5¼ in.; width of driving belt, 5 in. size of main spindle bearing, large end 4½ in. diameter by 5½ in., small end 3¼ in. diameter by 5 in.; diameter of hole through spindle, 1½ in.; speed of main spindle, 35 revolutions per minute; speed of back shaft, 175 to 227 revolutions per minute.



SHELL BORING LATHE FOR BORING 4.5 IN., 5 IN. AND 6 IN. SHELLS.

AUXILIARY HEAD FOR MILLING MACHINES AND LATHES

AN auxiliary head for use in milling machines and lathes is manufactured by Edgar W. Bemis, Worcester, Mass. It is made in two styles, on of which employs standard collets from ⅛ in, to ⅞ in., and the other a threaded plug adapter which is interchangeable with the collet. The main sleeve revolves in the casting and is flanged at its upper end to take the downward thrust when cutting. It is retained in place by the threaded collar on its lower end. A dividing plate with spring plunger for locating it by slots is mounted on the centre of the sleeve, being kept from turning by a key.

AUXILIARY HEAD FOR MILLING MACHINES AND LATHE

This plate is interchangeable, and by the use of suitable plates, a great variety of operations can be quickly performed. Straddle milling nuts of all kinds, either square or hexagon squaring heads of poppet screws, planer bolts, ends of taps, etc., cutling multiple threaded screws on the lathe, and drilling holes on circles, etc.

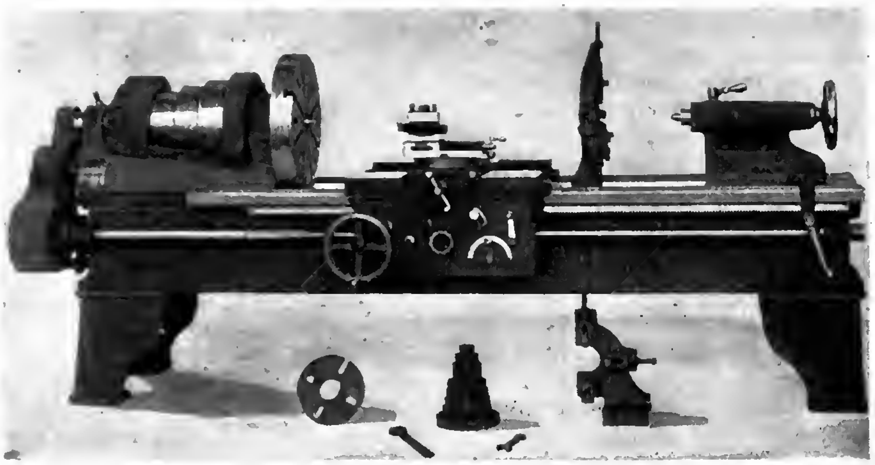
22 IN. ENGINE LATHE

THE engine lathe shown in the accompanying illustration is built by the Davenport Locomotive Works, Davenport, Iowa, and is designed for extra heavy service. The headstock is of conventional design, fitted with a three-step cone and double back-gears giving nine speeds in geometrical progression. The hollow spindle is made of .50 carbon steel, with ground bearings running in bronze boxes.

Semi-steel is the material of which the bed is formed, the section of the bed being unusually heavy and rigidly braced with cross girths. The tailstock is of the cut-away type with set over adjustment for taper turning.

The driving cone has 14, 12, and 10 in. dia. steps for 4 in. belt, the ratios of the two back gears being 12.58 to 1 and 3.56 to 1. No. 5 Morse taper centres are

fitted. The carriage has a long bearing on the two vees, has tee slots and a flat top. Apron is of the double wall type, and is arranged so that the cross feed and lateral feed cannot be engaged simultaneously. All feed gears are of



22-INCH ENGINE LATHE FOR EXTRA HEAVY SERVICE.

steel. Change gears supplied enable threads to be cut from 2 to 18 per inch, including 11½.

The countershaft is of the double-friction type with 14 in. pulleys, and the equipment includes 1 large and 1 small face plate, 1 steady and 1 follow rest, and necessary wrenches. With an 8 ft. 3 in. bed, this lathe takes in 3 ft. 3 in. between centres and weighs 5,200 lbs.

DIE-FILING MACHINE

A MOTOR-DRIVEN die-filing machine of interesting design is illustrated herewith. The main frame which encloses the mechanism is arranged to tilt over on the base, being supported on a curved seat and secured in the desired position by two thumb-screws. The reciprocating mechanism consists of a shaft, the outer end of which carries the belt pulley, and the inner end a crank disc with crank pin. The chuck for holding the file is mounted on the upper end of a reciprocating shaft or pitman, the lower end of which extends down past the inner end of pulley shaft, and enters a bushing with connecting passages so formed that the rod end acts as a plunger pump, distributing oil over all of the working parts. A cross-head mounted on the pitman engages with the crank pin.

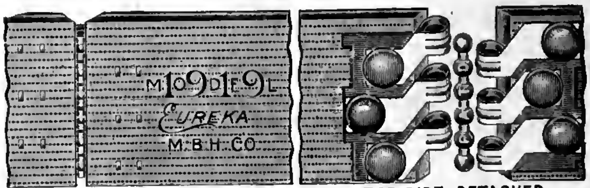
This pump action serves the further purpose of taking up the impact of the pitman and renders the operation of the machine very smooth. The machine uses standard files of the form made for use on die-filing machines, and the chuck is designed to give a three-point contact on the round shank of the file. The table can be tilted in relation to the file so as to give draft in either direction.

Table diameter is 9 in.; stroke of spindle 1 in.; height, 12 in.; space occupied, 10 in. x 16 in.; weight, 54 lbs. Belt drive furnished when required. The makers of this machine are the Illinois Tool Works, Chicago.

MOTOR-DRIVEN DIE-FILING MACHINE.

A BALL BEARING BELT COUPLER

A BELT coupler possessing interesting features of construction is offered to belt users by the Manufacturers Belt Hook Co., Chicago. The device is adaptable to all kinds of belting, and consists of steel clasps for the belt ends, and a steel spindle with ball-shaped swellings, each of which is enclosed by a section of the clasp. The clasp sections are steel stampings, one end being formed with hooks, which are driven into the belt



PULLEY SIDE, ATTACHED — TOP SIDE, DETACHED

when the other end is riveted on top with a bifurcated rivet which clinches on the lower surface of the belt.

The result of this construction is to give a ball bearing, noiseless, detachable, flexible steel belt lacing which can be attached with a hammer and used over again when required.

Electrically-Heated Soaking Pits.—Electrically-heated soaking pits for ingots, in place of the fuel-fired ones, are attracting interest in the steel world, says the Iron Age. Our contemporary gives a few figures concerning the electric soaking pits invented by T. F. Baily, president of the Electric Furnace Co., Alliance, Ohio, and adds that these can compete with gas-fired pits even where moderately hot stripping and charging is practised. The electric pit further has the advantage of a non-oxidizing atmosphere, which means a saving of from 1 to 2 per cent. of the weight of ingots put through the pit. It also takes only one-third the space occupied by a gas-fired pit of the same capacity. A feature of still greater importance is the elimination of surface defects in the ingots.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager
PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.
H. C. FOGARTY.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. APRIL 13, 1916 No. 15

WORLD'S INDUSTRY IMMEDIATELY FOLLOWING PEACE DECLARATION

SIGNS are not wanting, that the period of transition through which the world's industry must pass after the war, is engaging the earnest attention of all students of political economy. The situation is altogether unparalleled, and, in the absence of any exact precedent, many opinions are being expressed in which the wish is father to the thought. The hope is cherished in the minds of the general public that, because in the past conflicts between nations have been followed by periods of extreme activity and reconstruction, so the present world conflict will be followed by a similar reaction or condition of things. The hope is worthy of all commendation and while trusting that it will be fully realized, the fact remains that there is one vital difference which prevents an exact parallel being drawn between the present and any former period.

During the American Civil War, for instance, while the declaration of cotton as contraband was a serious blow to the financial resources of the Southern States, its effect on many thousands of England's industrial workers were what might aptly be termed disastrous. There was no increased activity in other branches of British industry to offset the trade depression or mitigate the personal privations endured as a result of this action. War orders from either the Federal or Confederate States did not even mount into millions, much less into hundreds of millions, as orders from the Allies meantime do. Consequently, the chief factor in American industrial activity following the Civil War was the realization of the value of the natural resources of the country. The value of these as a national asset was indispensable in placing the credit of the country on a sound basis, to be immediately followed by an industrial development, the natural sequence to the conditions. An influx of European capital was also greatly facilitated.

Whatever the outcome of the war, it hardly seems probable that history will repeat itself. When peace reigns again Europe will not be in the position of a young country with undeveloped resources. With more than half her constituent nations bankrupt and the whole more than half bankrupt, and assets consisting principally of exhausted credit and broken men, the probabilities of a rapid recovery seem to be rather remote.

Bitter as was the Civil War, and difficult the reconciliation, they are quite o'er shadowed by the present breach of national faith and the revulsion which will exist throughout the civilized world towards the Teutonic race, probably for centuries to come.

That this national ostracism will militate against the resumption of the 'status quo ante' of the world's trade, cannot be gainsaid. If, in considering future industrial conditions, Canadian manufacturers desire to form an analogy between past and present, then they and not Europe will be the favored part of the world. The transference of sums of money, vast beyond imagination, from Europe to America will continue till a decision is reached in the conflict. By that time the United States will have an immense amount of unemployed capital for the investment of which there will be no domestic demand.

Its manufacturing resources in constructive industry like those of Canada have been developed to an extent beyond all possible permanent requirements. What then will be the probable ultimate rearrangement of the world's industrial power? The inevitable delay in the resumption of peace conditions and the temporary dislocation of various industries will be largely mitigated by the readiness with which Canada and the United States show their appreciation of the situation.

The utilization of Canada's industrial and agricultural resources will be due to her position in and efforts on behalf of the Empire . The United States will be compelled by internal economic conditions to maintain its present activity by participating as far as possible in European reconstruction. Such participation will, however, be limited by the necessity of conserving Allied credit. As an integral part of the British Empire, this country will be in a position to benefit from probable fiscal developments which will balance to a desirable extent the preponderance of wealth and industry which war conditions have created in our southern neighbor.

GENERAL BUSINESS CONDITIONS

A GRATIFYING feature of the present industrial situation is the steady improvement in domestic business, due to the prosperous condition of the country. The outlook for an increase in exports, other than munitions and war supplies, has improved considerably and manufacturers are looking for more important developments. The spring weather has had a stimulating effect on many industries and the outlook generally is distinctly favorable. Navigation will be open on the Lakes and St. Lawrence very shortly, which will considerably relieve the congest of freight at railroad terminals. The situation in this regard has been getting more and more acute and has caused considerable delay to shipments and inconvenience to merchants. The customs returns for Toronto for the fiscal year which ended on March 31, are almost two million dollars in excess of the greatest previous year in the history of the port. There has been a very marked gain in revenue since September, and March showed the largest increase for any month.

Manufacturers are concerned over the shortage of labor which is beginning to be felt, and which will become more serious as the number of battalions for overseas increases. The shortage of raw materials is also becoming a serious question for manufacturers to contend with, in addition prices are still rising, thus increasing the cost of production. The upward trend in prices of finished products continues, a number of advances having been made during recent weeks.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 70	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	

	Montreal.	Toronto.
Middlesboro, No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b., Toronto	3.00
Steel bars, 2 in. and larger, base	4.00
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	3.00
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	3.00
Small shapes	3.25
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	3.10
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$31 00	$30 50
Electrolytic copper	31 00	30 50
Castings, copper	30 00	30 00
Tin	51 00	58 00
Spelter	23 00	23 00
Lead	10 00	11 00
Antimony	48 00	48 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in.	$3 75	$3 75
Heads	4 00	4 00
Tank plates, 3-16 in.	4 05	4 10

WROUGHT IRON PIPE

Prices in effect April 3, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 00	5 31
1/2 in.	3 83	5 91
3/4 in.	4 60	7 42
1 in.	6 80	10 97
1 1/4 in.	9 20	14 84
1 1/2 in.	11 00	17 74
2 in.	14 80	23 87
2 1/2 in.	23 40	37 73
3 in.	30 60	49 34
3 1/2 in.	36 80	59 34
4 in.	43 60	70 31

Lapweld

	Black	Galv.
2 in.	16 28	25 35
2 1/2 in.	23 99	38 32
3 in.	31 37	50 11
3 1/2 in.	37 72	60 26
4 in.	44 69	71 40
4 1/2 in.	54 61	87 00
5 in.	63 64	101 40
6 in.	82 56	131 50
7 in.	114 20	174 90
8 in. x 25 lbs. per ft.	120 00	183 80
8 in. x 25 lbs. per ft.	138 20	211 70
9 in.	165 60	253 60
10 in. x 32 lbs. per ft.	153 60	235 20
10 in. x 40 lbs. per ft.	197 80	302 80

Ontario list—All points from Kingston and west to, but not including Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	2 94	5 25
1/2 in.	3 74	5 82
3/4 in.	4 49	7 30
1 in.	6 63	10 80
1 1/4 in.	8 97	14 61
1 1/2 in.	10 73	17 46
2 in.	14 43	23 50
2 1/2 in.	22 82	37 15
3 in.	29 84	48 58
3 1/2 in.	35 88	58 42
4 in.	42 51	69 22

Lapweld

	Black	Galv.
2 in.	15 91	24 98
2 1/2 in.	23 40	37 73
3 in.	30 60	49 34
3 1/2 in.	36 80	59 34
4 in.	43 60	70 31
4 1/2 in.	53 34	85 73
5 in.	62 16	99 90
6 in.	80 64	129 60
7 in.	111 90	172 60
8 in. x 25 lbs. per ft.	117 50	181 30
8 in. x 28 lbs. per ft.	135 40	208 80
9 in.	162 20	250 10
10 in. x 32 lbs. per ft.	150 40	232 00
10 in. x 40 lbs. per ft.	193 60	298 70

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 00	$18 00
Copper, crucible	21 50	21 00
Copper, heavy	21 75	20 75
Copper wire	21 75	20 75
No. 1 machine compos'n.	16 50	16 50
No. 1 compos'n turnings.	14 75	14 50
New brass clippings	16 00	14 50
No. 1 brass turnings	11 75	11 50
Heavy melting steel	9 00	9 30
Boiler plate	11 75	14 00
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	10 50	9 00
Stove plate	10 50	9 50
No. 1 machin'y cast iron	14 75	14 00
Heavy lead	7 25	7 25
Tea lead	6 25	6 25
Scrap zinc	15 00	15 75
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	55
Stove bolts	65
Plate washers	30
Machine bolts, 3/8 and less	47 1/2
Machine bolts, 7-16 and over	37 1/2
Blank bolts	37 1/2
Bolt ends	37 1/2
Machine screws, flat head, iron	06 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in. $3.75 per lb. off	
Nuts hex., over 1 in. $2.00 per lb. off	
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	42 1/2
Boiler rivets, base, 3/4-in. and larger	$4.35
Structural rivets, as above	4.10
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS.

	Per cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	60
Finished nuts over 1 in.	55
Semi-Fin. Nuts up to 1 in.	60
Semi-Fin. Nuts over 1 in.	55
Studs	45

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	67 50
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES.

Standard steel wire nails, base	3 45	3 65
Cut nails	3 20	3 20
Miscellaneous wire nails	75 per cent.	
Pressed spikes, 5/8 diam., 100 lbs.	$3 75	

MISCELLANEOUS

Solder, guaranteed	0.31½
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.80
Linseed oil, raw, single bbls.	.98
Linseed oil, boiled, single bbls.	1.01
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Lead wool, per lb.	0.13
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	50
Standard drills over 1½ in.	15
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	10
Bit stock	50
Ratchet drills	15
Machine bits for wood	10
S.S. drills for wood	20
Wood boring brace drills	35 and 5
Electricians	20
Sockets	50
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks	list plus 5
Bridge reamers	55
Centre reamers	5
Chucking reamers	5
Hand reamers	5

High speed drills and reamer prices withdrawn.

COLD ROLLED SHAFTING

At mill	list plus 20%
At warehouse	list plus 30%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 5 per cent.; B and C, 25 per cent.; cast iron, 50 and 10; standard bushings, 60 per cent; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$4 00
Sheets, black, No. 10	4 35	4 50
Canada plates, dull, 52 sheets	4 00	4 25
Canada Plates, all bright	6 30	6 00
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	6 75	6 75
Premier, No. 28, U.S.	7 25	7 00
Premier, 10¾ ozfl.	7 50	7 25

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.55
3/8 in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
5/8 in.	6.35
¾ in.	6.15
7/8 in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B.B

1/8 in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
3/8 in.	6.35
7-16 in.	6.35
½ in.	6.35
5/8 in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	65-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	.....
1¼ in.	19 55	.....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	12 10
2¼ in.	26 60	13 30
2½ in.	29 00	15 95
3 in.	38 79	16 06
3½ in.	44 00	22 00
4 in.	49 50	27 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, 3/8 in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, 3/8 in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble, 40 & 10%	
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.15¼
Peerless	.15¼
Grand	.14¼
Superior	.14¼
X L C R	.13¼
Atlas	.13¼
X Empire	.12¼
Ideal	.12¼
X press	.11¼
COLORED.	
Lion	.09½
Standard	.08¾
No. 1	.08¾
Popular	.07¾
Keen	.06¾

WOOL PACKING.

Arrow	
Axle	Prices on
Anvil	application
Anchor	

WASHED WIPERS.

Select White	
Mixed colored	Prices on
Dark Colored	application

This list subject to trade discount for quantity.

COPPER SHEETS

	Montreal	Toronto
Bars. ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 m..	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.34 to .36
Tin	.50 to .54
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck.	.90
Emery in kegs, American..	.03 to .04
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass...	.15 to .25

Prices Per Lb.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy	.35
Copper sulphate	.25
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)..	.20
Silver chloride ....(per oz.)	.65
Silver nitrate ....(per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., April 10, 1916.—Gradual improvement is reported in many branches of domestic activities. While the bulk of present business is largely that of war supplies and munitions, it is encouraging to note the constant and ever increasing volume of industrial activity which is developing, indirectly, from war conditions. The Canadian manufacturer is alive to future possibilities, and no time is being lost in acquiring a large portion of new business, which must ultimately be transacted in new fields.

Present weather conditions point to the early opening of navigation, which will materially aid in the present congested state of shipping facilities.

Pig Iron

No change is noted in the pig iron situation. Furnaces continue working to capacity in supplying the requirements of the steel producers. United State's prices are very firm. Philadelphia price on No. 2 foundry, shows an advance of $5. per ton.

Steel

The general condition of the steel situation is one of comparative quiet, but no indication of weakness is shown. The mills in most cases are well sold for the remainder of the year, and buyers are also well covered for a greater portion of the same period. There is a feeling abroad that the top of the market, if not already reached, is close at hand; and while further advances will likely be reported, they are expected to be on commodities which have been dragging behind the general market. No change is reported in unfinished steel prices, with the exception of forging billets which are now quoted at $75 per ton. Heavy rail orders during the past month have resulted in an advance of $5 per ton and Pittsburg prices are now 2.10c and 2.15c with possibilities of further advances. Iron bars, with an advance of $2 a ton are quoted at 2.60c Pittsburg. The price on steel hoops is now $3 per hundred, an increase on the week of $5 a ton. Galvanized sheets are very quiet, but increased activity is noted in black and blue annealed sheets; No. 28 Pittsburg black is now quoted at 3.10, an advance of $2 a ton and blue annealed has advanced 75 cents per hundred, this week's price being $3.75. Wire products have been advanced 10 cents per hundred.

Metals

The general tone of the metal market is one of strength, not that any exceptional developments have transpired to change the situation, but the feeling is abroad that a period of activity is close at hand. Large quantities of copper have been ordered by the French and British governments and with additional domestic requirements, the situation is taking on strength. The tin situation is being affected by the shortage of ocean bottoms and the market is high and uncertain. Domestic spelter is quiet, but foreign demand is strong while prices have an upward tendency. Lead continues very firm and the demand is heavy.

Copper.—The recent activity in the market, following the previous quiet period of a couple of weeks ago, has had the effect of strengthening the present copper situation. During the past two weeks the French government have contracted for approximately 35,000,000 lbs., and the British authorities have just recently placed orders, for this years delivery, to the amount of 60,000 tons of metal. This foreign demand, with the increased requirements of the home markets has resulted in one of the greatest buying movements in the history of the copper trade. London cables report an advance on last week's quotation of £2 on all coppers. Standard spot is now quoted at £118, futures at £115 and electro spot at £134; this last however is a decline of £1 over the previous day's figures. New York prices on lake and electrolytic are ¾ cent per pound higher, present quotations being 28 cents for each. Castings, quoted at 26½, show an advance of ½ cent per pound. Consumers are continuing to cover their requirements for many months ahead, and present indications are a future shortage of metal. The present copper situation is in a stronger position now than at any time since the opening of the war. Local dealers report a good market with prices firm and nominal at unchanged prices of 31 cents for lake and electro, and 30 cents for castings.

Tin.—The upward movement in tin continues and prices are gradually ad-

vancing, both on this side and on the British markets. The chief cause of the strong tone is the small arrivals of tin shipments, and indefinite information regarding new arrivals. The inability to calculate the time of arrival of tin bearing vessels from the east is keeping the market in a strong condition. In addition to this the demand is expected to increase during the next few months, and unless some relief is shortly announced, further advances are expected. London prices are quoted at £202 for spot; £196 for futures; an advance of £3 and£2-15 respectively. Straits tin, with an advance of £2 is quoted at £202. The New York market is quoting the nominal figure of 53½ cents per pound, being an advance over last week of 4½ cents. The nominal price of 51 cents is being quoted, for early delivery.

Spelter.—The market is very firm following a good export demand. The domestic requirements are fair and future demand has so far been light. It is reported that foreign demand has resulted in considerable tonnage being contracted for, and any large amount of home buying under present conditions, would likely be followed by further advances, as producers seem in no mood to sell freely. The British situation is undergoing some uneasiness at the present time, and while the price on spot and early spelter is lower, considerable inconvenience is being experienced by many consumers, owing to non-arrival of contracted supply, due to inadequate shipping facilities. London quotation for spot spelter is now £94, and futures £84. New York quotes the nominal price of 18.80 for prompt shipment. Local conditions are unchanged and prices firm at 23 cents per pound.

Lead.—The recent upward rush has apparently settled down, but it is not expected that any immediate weakness will be shown. The present high tone of the lead situation is largely influenced by the excessive consumption for munition purposes. Certain British regulations have a tendency to limit the business, but the quiet and steady demand from the far east is keeping the markets in a firm and steady condition. In the hope of creating new business some dealers are offering slight concessions to buyers. The London market has declined 27 shillings on spot and £33. 10s. and £33. 15s. respectively. The Trust price remains firm at 7½, while the outside interests have declined ¼ cent and are now quoting 7.875 per pound. Local prices are steady at 10 cents and conditions are unchanged.

Antimony.—The market is comparatively quiet and prices are holding firm. Consumers are only covering their immediate requirements and heavy trading is practically at a standstill. The nominal price of 48 cents is being quoted.

Aluminum.—The market is quiet and prices remain unchanged at 68 cents a pound.

Machine Tools and Supplies

Activity in the machine tool industry is becoming quieter, and normal conditions are gradually asserting themselves. However, the requirements of the shell producing shops are continually calling for additional tools which will keep the machinery builders from being idle for many months to come. In some respects the needs of new industries will somewhat compensate for the falling off of munition demands. Many manufacturers are building or contemplating building additions to present factories, in anticipation of future requirements. The small supplies market is exceptionally active, and the demand for small accessories is very heavy, it being almost impossible for manufacturers to supply the full requirements of the trade.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Old Materials

The trade in scrap metals is very active and business is reported good. Prices for old copper have advanced and the demand is heavy for all grades of old copper, crucible at 21½ cents is ½ cent stronger; heavy copper and copper wire with an advance of 1 cent are quoted at 21¾ cents per pound. Old stove plate is in good demand and this week's quotation of 10½ cent shows an advance of 1 cent per pound. New York prices on old materials show considerable increase on copper and lead scrap, and aluminum has jumped from 2 to 5 cents per pound 2 cents for old and 5 cents for new scrap.

Toronto, Ont., April 11.—No better indication of the prosperity which the steel and engineering industries are at present enjoying can be found than in the annual reports of the various companies which have been issued recently. The most interesting statements since the Nova Scotia Steel & Coal Co. and Canadian General Electric reports were published have been those of the Steel Company of Canada, the Canadian Fairbanks-Morse Co., and the Canada Machinery Corporation. In all these cases handsome profits have been made, and the companies placed in a sound financial condition. These satisfactory results have, of course, been obtained in abnormal times, but the benefits derived will be of the greatest possible assistance in maintaining the stability of these concerns after the war, when business will probably be dull for a time until the situaton is adjusted and conditions become normal again. A number of smaller, but none the less important companies, are also very prosperous, and have benefited considerably by making munitions or machine tools for munition plants.

Business generally continues to improve and the outlook is bright. The Dominion revenue for the fiscal year ending on March 31st shows an increase of $39,550,000 over the previous twelve months. For the month of March the Customs revenue totalled nearly ten million dollars, being an increase of over two millions more than the corresponding months of last year. There is no sign of any recession in any market, and prices continue to advance as raw materials continue to rise and are becoming more difficult to obtain. The principal advances this week include wrought iron pipe, bolts and nuts, shafting, files, black sheets, some oils and compounds, wire nails, tin, and spelter.

Steel Market

The situation in the steel trade continues very satisfactory, and the market is strong, with prices still rising. The extremely satisfactory annual statement recently issued by the Steel Company of Canada is an indication of the prosperity which prevails in the steel industry. Not only are the steel companies in excellent shape financially, but they have all made important additions to their plants, which are in good condition. The output of the mills is sold up to the end of this year, which is a guarantee of continued activity and large earnings. Although prices have an upward tendency, there is a general feeling that they are quite high enough. It is largely a matter for speculation as to when the top will be reached, and there is no indication at the present time of a halt in the upward movement.

Prices of some iron and steel products have advanced. Wrought iron pipe has been affected, black pipe having advanced two points for all sizes, and galvanized six points for ¼ in. and ⅜ in., and three points for all the other sizes. The new prices are given in the selected market quotations. Cold rolled shafting is higher, the new price being list plus 30 per cent. at warehouse and list plus

20 per cent. at mill. The prices are for delivery at mill convenience. A new list of discount for bolts and nuts has been issued. Wire nails have advanced 25c, and are now quoted at $3.65 per keg base. This advance is due to the increase in cost and great scarcity of wire rods. A sharp advance in boiler tubes may be expected any time, and higher prices for cut nails are likely in the near future. Mild steel and iron bars are unchanged at $3 and $2.75 per 100 pounds, but higher prices have been made in sleigh shoe steel at $3; reeled machinery steel at $4.50; toe calk steel at $3.95, and spring steel at $4.50 per 100 pounds. Mining and silver tool steel are higher at 10c and 18c per pound respectively.

The galvanized sheet situation is unchanged, and the market continues strong. Spelter is too high to be attractive and black sheets are advancing steadily, thus curtailing production of galvanized sheets. Prices are unchanged in the meantime, but an advance in the near future is highly probable. The big demand for black and particularly blue annealed sheets in the primary market has caused an advance in prices, and is also making deliveries more backward. Black sheets, No. 28 gauge, are quoted locally at $4, and No. 10 gauge at $4.50 per 100 pounds.

An interesting feature in the steel market in the United States is the possible advance in the price of rails. The base price of steel rails has stood at $28 per ton for over fifteen years, but owing to the unusual conditions prevailing in the trade a change will probably be made after May 1. The situation in the steel trade generally is unchanged, the demand being as insistent as ever. It appears likely that prices will remain high for this year, as the mills have enough business booked to practically carry them over the remainder of the year. Some authorities, however, believe that there are indications of a possible recession of prices. The production of billets is increasing, so is also the demand. Bessemer and open-hearth billets are unchanged at $45 per ton, but forging billets have advanced to $67.50 per ton, base, Pittsburgh. Wire rods have also advanced, and are now being quoted at $60 per ton Pittsburgh. The ferromanganese situation continues acute, and very high prices are being paid for prompt shipments; prices ranging all the way from $4.00 to $4.50.

Pig Iron

The price of grey forge pig iron has advanced 25c to $18.70 f.o.b. Pittsburgh. Hamilton and Victoria pig irons are unchanged at $24 per ton. The demand for steel-making pig iron is extremely heavy, while there is a marked improvement in the demand for foundry grades.

Old Material

The market is holding firm, with a tendency towards higher prices. Business is showing some improvement, particularly in copper, which is in good demand.

Scrap lead is very firm in sympathy with the pig lead market, but prices are unchanged. Prices of light copper, machine composition, composition turnings, brass clippings and brass turnings are about 25c per 100 lbs. higher. Heavy melting steel is firmer and the position of this material is improving.

Machine Tools

Conditions in the market are much the same as they have been for some weeks. The demand continues fair, and is almost entirely for munitions plants. A number of firms who have hitherto been making 18-pdr. high explosive shells are equipping their plants for handling 4.5 in. shells. Machine tool makers are very busy on equipment for shell plants. The Canada Machinery Corporation have issued an interesting statement, which indicates that machine tool makers are enjoying a period of prosperity.

Supplies

Business continues good and the situation unchanged. Prices on all supplies are very firm, and advances in some lines, such as white lead, gasoline, benzine and solder, are expected. Only a few changes of any importance have been made this week. Plumbers' oakum has advanced 1c, and is now quoted at 7c per pound. Some makes of files have advanced from 70 per cent. to 65 and 10 per cent. discount. Some oils and cutting compounds have advanced. Machine oil is now quoted at 26½c; lard oil, $1.35; thread-cutting oil, 35c, and quenching oil, 38½c per gallon. Standard cutting compound is quoted at 6c per pound. Turpentine and linseed oil are steady and unchanged.

Metal Market

The demand continues active for metals for munitions, and the consumption for other purposes is steadily improving. The feature this week is a sharp advance in tin, following an upward movement in London and Nw York. The position of tin has improved considerably, and it is expected that the market will go still higher. Lead is unchanged at the high level reached during last week, but the market is a little easier. The copper situation is unchanged, but the market is very firm and quotations are still nominal. Large contracts have been placed for copper in the United States by the British and French Governments, which has strengthened the position of this metal. The demand for spelter is heavier and the market firm, with some possibility of higher prices. The antimony situation is unchanged, and there is nothing of particular importance to note with regard to this metal. The same may be said of aluminum, which is still very scarce and high in price. Solders are unchanged, but higher prices may be looked for, particularly now that the tin market is rising.

Copper.—The most interesting feature in the copper market is the announcement that the British and French Governments have contracted for a very large amount of copper in New York. It is said to be the largest tonnage of copper that has ever been sold in the States. The transaction has not as yet affected prices materially, but will have a tendency to keep the market firm for several months, and may eventually cause higher prices. Locally the market is firm and unchanged at 30½c per pound nominal.

Tin.—Tin is higher locally, following an advance in London and New York. The strength in the market is due to increased consumption and scarcity of spot metal. New York market is also being affected by the difficulty in getting permits to ship from England, which is interfering with business. Tin has advanced 4c, and is now quoted at 58c per pound nominal.

Spelter.—The market is firm and higher in New York on account of a good demand for spelter, particularly for export. It is said that producers are holding back and offering less spelter now than they have done in a long time, both for nearby deliveries and futures. Spelter has advanced locally, and is now quoted at 23c per pound.

Lead.—The market is dull and easier after the recent advance. The "Trust" price is being held at 7.50c New York, but the open market is weaker, the price ranging from 7.62½c to 7.87½c. The lead situation is unchanged, and the demand continues heavy. Lead is unchanged locally at 11c per pound.

Antimony.—The market is featureless and quotations nominal at 48c per pound.

Aluminum.—The market is quiet and easier. Quotations have a weaker tendency, but are in the meantime unchanged and nominal at 68c per pound.

CANADIAN FAIRBANKS-MORSE YEAR

ANOTHER striking example of the astonishing change that the past year worked in the fortune of Canadian industrials is furnished in the annual statement of the Canadian Fairbanks-Morse Co., Ltd., which shows a net profit of $709,048, for 1915, against a net loss of $101,099 in 1914.

After providing for preferred stock dividend the 1915 balance available for distribution on the common stock was $619,048, against a deficit of $191,099 the previous year. In 1913, the corresponding balance was $134,792, and $340,428 in 1912—the last named year probably representing a high level in the company's earning power up to the year just closed.

Earnings on the common stock last year work out to 38.7 per cent., and in view of the fact that common stock dividends, formerly at the rate of 8 per cent. per annum, had to be discontinued in 1914, the directors have treated shareholders generously. In addition to a cash dividend of 4 per cent. paid during the year, they have declared a dividend of 12½ per cent., payable in Canadian war loan bonds. This still left $361,338 to be added to surplus, more than doubling that account. Comparisons of profit and loss figures for three years follow:

	1915.	1914.	1913.
Profits	$709,048	*$101,099	$224,792
Pref. div.	90,000	90,000	90,000
Balance	$619,048	†191,099	$134,792
Com. dividend	257,710	......	128,000
Balance	$361,338	†$191,099	$ 6,792
Prev. balance	336,498	527,598	520,805
Surplus	$697,836	$336,498	$527,598

*Loss. †Deficit.

The company was notably fortunate in that it shared in the two main sources of business improvement in Canada last year—munition manufacture and record-breaking grain crops. "As anticipated," says H. J. Fuller, president, in his annual report, " our business during the early part of 1915 was in comparatively small volume, but as the year progressed the demand for machine tools and supplies for munitions factories in the East was of large and increasing volume, and we reaped the benefit of our large inventories and our ability to make prompt delivery.

Reference is made to the company's success in the manufacture of shrapnel shells, started in the fall of 1914. The company expects to be making substantial shipments of large size howitzer shells at an early date, the equipment having been installed in the latter part of 1915. Bank loans which were reduced from $780,133 to $557,048 in 1914, were wiped out altogether during the past year. Current assets foot up $3,517,497, approximately seven times current liabilities of $751,460. Current assets were increased about $360,000 in the year, while current liabilties were reduced $176,000. Against $120,436 in cash at the end of 1914, the present statement shows $308,083, in addition to $20,000 paid on the company's war loan subscription. The balance sheet also shows that depreciation resrve was increased by about $90,000 in the year, while capital assets were written down about $63,000.

The balance sheets of the past two years show the following comparisons:

Assets.

	1915.	1914.
Plant, etc.	$1,292,984	$1,355,211
Inventories	1,269,543	1,668,313
Accounts receivable	1,562,243	1,096,596
Bills receivable	357,626	324,309
War loan	20,000	......
Cash	308,083	120,436
Def. charges	62,795	30,450
Deposits	......	1,868
Totals	$4,873,276	$4,597,186

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Hamilton, Ont.—The Canada Wire Goods Co. will build an addition to their plant.

Galt, Ont.—The Perfect Machinery Co. will build a factory, to cost $5,000. S. L. Clarke is manager.

Toronto, Ont.—L'Air Liquide Society will make an extension to their factory on Boler St., to cost about $3,000.

Fassett, Ont.—The Standard Chemical Co., will rebuild their plant here which was destroyed by fire recently.

Halifax, N.S.—The Halifax Electric Tramway Co., will build a by-product house and a cold storage building at their gas plant.

Welland, Ont.—The Volta Mfg. Co. has purchased a site here, and will build a machine shop for making electrical appliances, etc.

Wallaceburg, Ont.—The Wallaceburg Brick Co. is in the market for a single-cylinder, 50-hp. or over, stationary, natural gas engine.

Donnacona, Que. — The Donnacona Pulp & Paper Co. are erecting a new building, 425 feet by 50 feet. The cost is estimated at $100,000.

Brockville, Ont.—The Canadian Foundries & Forgings Co. will build an addition to its tool department to take care of increased business.

Toronto, Ont.—A. R. Clarke & Co., will erect a one-storey frame and galvanized iron enamelling shop on Eastern avenue, at a cost of $5,400.

Amherst, N. S.—The Ledcote Co., of Canada Ltd., has taken over a property here and is installing plant for covering sheets, etc., with lead as a substitute for galvanizing. William Knight is president of the concern.

Sudbury, Ont.—The Sable River Mining Co., are installing a "Callow" 50-ton flotation plant at their property near Massey Station. The plant is for treating copper ores, and will have a capacity of 50 tons per day. J. F. Flynn is manager of the Company.

Sherbrooke, Que.—A proposal is under consideration to develop power at Westbury Basin for an ultimate capacity of 5,400 h.p. at Westbury Basin switchboard and 5,000 h.p. at the switchboard at Sherbrooke substation. The cost of power equipment and erection would be $77,800 and for the complete development including excavation, buildings and transmission lines, etc., $305,567.

Electrical

Appin, Ont.—The Village Council may install an electric lighting system.

Cobalt, Ont.—The Northern Ontario Power Co., will call for tenders on the construction of a 60 mile transmission line to Kirkland Lake. Complete equipment will be required.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

General Industrial

Paris, Ont.—Penman's Ltd., will build an extension to their factory here at a cost of $15,000.

Hamilton, Ont.—The Skedden Brush Co. will build a factory here at an estimated cost of $3,000.

Toronto, Ont.—The Comfort Soap Co. are making an addition to their factory on Eastern avenue, at a cost of about $4,000.

Toronto, Ont.—William Neilson, Ltd., will make an extension to their candy factory on Gladstone avenue to cost about $25,000.

Weston, Ont.—A. B. Moffatt, representing the Pellatt estate, appeared before the council on April 4, and asked that a final assessment and water power be granted to a large manufacturing firm that contemplate locating here.

Welland, Ont.—The Business and Industrial Committee at a meeting held recently authorized Chairman George Clarke and Mayor Clendenning to negotiate with the Perfection Tire and Motor Co., which seeks to establish a branch plant in Canada.

Municipal

Quebec, Que.—The City Council will call for tenders for 2,000 feet of fire hose and a large quantity of copper wire.

Sault Ste. Marie, Ont.—The City Council are considering the construction of a waterworks system, estimated to cost $300,000.

Toronto, Ont.—The City Council has decided to build a subway under the Grand Trunk tracks on Ashdale avenue, Norway. It will cost approximately $33,000, and will be 8 feet by 12 feet.

Tenders

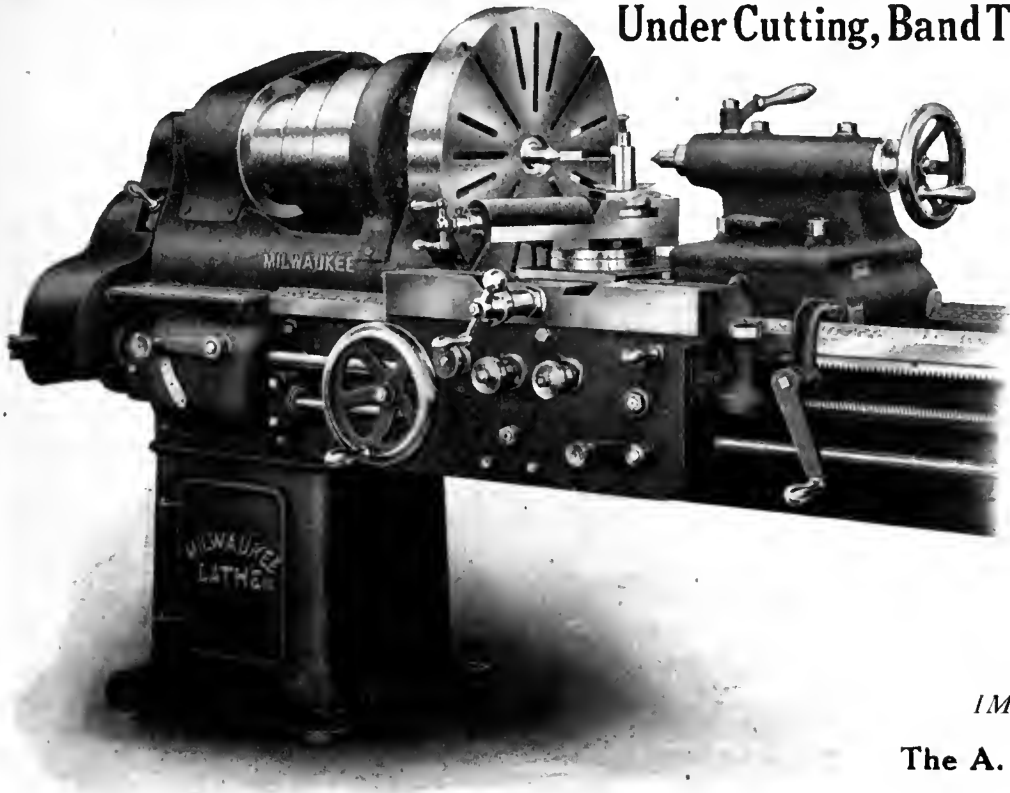
Halifax, N.S.—The Halifax Electric Tramway Co. are calling tenders on elevating and conveying machinery for their new gas plant. Engineer, H. R. Barrett.

Calgary, Alta.—Tenders, addressed to the City Commissioners, will be received up to Monday, April 17th, 1916, for the manufacture and delivery of direct current circuit breakers. Specifications, etc., may be obtained at the office of the City Electrical Engineer.

Kenilworth, Ont.—Tenders will be received up to April 17, for the erection of a number of small bridges and culverts in the Township of Arthur. Specifications, dimensions, etc., may be seen at clerk's office, Kenilworth. A. Hellyer, Township Clerk.

Calgary, Alta.—Tenders sealed will be received until April 15 for the supply of all materials, tools and labor necessary for the construction of one to fourteen elevators. Plans and specifications

24″ Standard Milwaukee Lathe for Finish Turning, Wave Grooving, Under Cutting, Band Turning and Rectifying



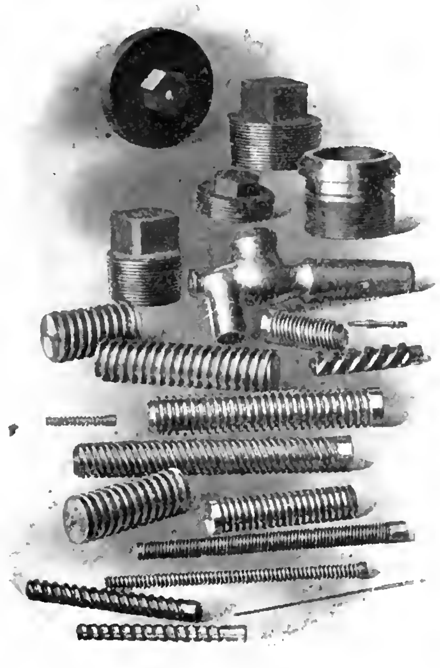
SPECIFICATIONS:

Swing over Bed.....	24½″
Swing over Carriage	15¾″
Dimensions of Front Bearing	3¾″ x 7″
Dimensions of Rear Bearing	3″ x 5″
Hole through Spindle	2 1-16″
Diameter of Spindle Nose	3½″
Pitch of Thread on Spindle	5
Diameter of Tail Spindle	2¾″
Taper Hole in Spindle Bushing.	No, 5 Morse
Cone Diameters ...	9¼″, 12⅛″,15″
Width of Steps on Cone	4⅛″
Ratios of Back Gearing	3.45 to 1 & 12 to 1
Length of Carriage	30″
Width of Bridge	9½″
Pitch of Lead Screw	4
Cut Threads from	1 to 16
Size of Turning Tool	¾″ x 1⅜″
Depth of Bed	15″
Width of Bed	20″
Length of Tail Stock on Bed	17″
10′ Bed takes between Centers, with Tail Stock even with end of Bed	5′ 6″
Countershaft Pulleys	16″ x 6″
Countershaft should run ...	150
Net Weight with 10′ Bed..	5,600 lbs.

IMMEDIATE DELIVERY

The A. R. Williams Machinery Co.
Limited
TORONTO CANADA

A THREAD IS A THREAD



A Thread is a Thread to a Geometric Die Head—Long threads or short, heavy or light work, large diameters or small, fine threads or coarse—they are all alike to the Geometric Die Head.

Whatever the make of your Screw Machine, a Geometric Self-opening and Adjustable Screw-cutting Die Head can be furnished to fit it.

Take up your threading proposition with us. Get acquainted now, and when in need of Screw-cutting Tools, you will find a Geometric the friend, indeed.

Let us know the class of screw-cutting that interests you, and we will send booklet describing the type of tool that is best suited to it.

The Geometric Tool Company
NEW HAVEN, CONN.

Canadian Agents:
Williams & Wilson, Limited, Montreal
The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg, St. John, N.B.

can be obtained upon application to the Alberta Farmers' Co-operative Elevator Co., Calgary.

Quebec, Que.—Tenders for freight shed and grain galleries will be received at the Quebec Harbor Commissioners' Office, Pointe-a-Carey Wharf, Quebec, up to April 15 next. Plans and specifications of the contemplated work may be seen at the harbor engineer's office, Pointe-a-Carey Wharf St. George Boswell, chief engineer.

Winnipeg, Man.—Tenders addressed to the chairman, Board of Control, will be received up to April 17, 1916, for the supply of Watt-hour meters for the City Light and Power Department for the period of one year from date of contract. Specifications and form of tender may be obtained at the office of the City Light and Power Department, 54 King street.

Winnipeg, Man. — Tenders addressed to the chairman, Board of Control, will be received up to April 17, 1916, for the supply of overhead and indoor construction materials for the city light and power department for the period of six months from the date of contract. Specifications and form of tenders may be obtained at the office of the City Light and Power Department, 54 King street.

Winnipeg, Man.—Tenders addressed to the chairman, Board of Control, will be received up to April 17, 1916, for the manufacture, delivery and installation in the King street Sub-Station of 3-1,000 k.v.a. transformers with switching apparatus complete. Specifications and forms of tender may be obtained at the office of the City Light & Power Department, 54 King street.

Vancouver, B.C.—The British Columbian Fisheries, Ltd., will sell their entire plant and equipment, including buildings, machinery, tools, refrigerating plant, sawmill and machinery ,fertilizer plant and equipment, power plant equipment ,steam trawlers and scows, etc. Tenders will be received up to April 15, and full particulars may be obtained from James Keppel Ball, Yorkshire Building, Vancouver, B.C.

Toronto, Ont.—Tenders addressed to the secretary-treasurer, Board of Education, will be received until April 13, 1916, for the following trades: For completion of Administration Building, College street; ornamental iron work, spiral stairs, iron railings, etc., elevator, ash hoist, vault doors, hardware trimmings, also for temperature regulators for Dewson street school. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall.

Winnipeg, Man.—Tenders addressed to the chairman, Board of Control, will be received up to April 17, 1916, for furnishing the City of Winnipeg with the following supplies as required during the six months ending October 31st, 1916, namely: Hardware, rubber goods, oils, grease, etc., castings, chemicals, Babbitt, solder, etc., auto sundries and supplies. Specifications and forms of tender may be obtained at the office of the city storekeeper, City Yards, corner Ross avenue and Tecumseh street.

Toronto, Ont.—Tenders for extension to sub-station building at Edwin and Ruskin avenues, addressed to the secretary of the Toronto Electric Commissioners, will be received until April 19, 1916. Separate tenders will be received for and should be marked as follows: Structural steel work; roofing and waterproofing; plumbing; painting and glazing; excavating masonry work. Specifications and forms of tenders may be obtained and plans consulted at Engineering Office, corner Duncan and Nelson streets.

Personal

David Alexander McIlroy, manager of the Hamilton Steel Construction Co., died at Hamilton, Ont., on April 9, aged 35.

Mark Workman, president of the Dominion Steel Corporation, has returned to Montreal after a ten days' inspection of the company's plant at Sidney, N.S.

Major William Henry Childs has resigned his position as assistant manager of the Hamilton Hydro-Electric Commission and joined the 173rd Highland Battalion. Major Childs served in the Boer war.

Allan Jenkins, who was second engineer on the freighter Empress of Fort William, which was sunk on February 26 in the English Channel by a German torpedo or mine, has arrived home at Orillia, Ont.

W. H. Robinson, of Granby, Que., was elected president of the Canadian Consolidated Rubber Co., at the annual meeting of shareholders held in Montreal on April 4, thus filling the vacancy left by the death of J. H. McKechnie.

Conrad F. Just, former Canadian trade commissioner at Hamburg, from which city he escaped with difficulty after the war broke out, is on the eve of departure from London to Russia, to take up similar duties at Petrograd. The possibilities for Canadian trade with Russia now and after the war will be thoroughly investigated by Mr. Just.

Trade Gossip

The Mueller Mfg. Co., of Sarnia, Ont., have been awarded a contract for waterworks supplies by the Town Council of Wallaceburg, Ont.

Fort William, Ont.—The Canada Car & Foundry Co., propose to remove their car plant from here and ship it to Vladivostock. The city council are strongly opposed to the arrangement.

The Hayes Wheel Co., of Chatham, Ont., which was recently incorporated, has taken over the Chapman wheel works at Chatham, and machinery will be installed for making automobile wheels.

W. W. Wells, 368 Victoria Street, Toronto, has supplied the Russell Motor Co., Toronto, with a 1,500 amp. motor-generator set for their plating department. This machine is equipped with a 16 h.p. motor, and can be run as either a two-wire or three-wire machine.

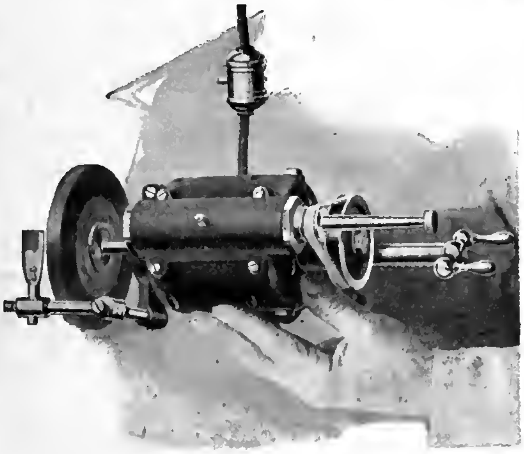
American Zinc.—The annual statement of the American Zinc, Lead and Smelting Co. of New York for the year ending December 31st last, shows net profits of $5,293,878, equal to 27.41 on the 193,120 shares outstanding, and an increase of $5,216,186 on the previous year. Reserve appropriations took $2,-642,378, an increase of $2,630,378 on 1914, leaving a surplus of $2,651,501, an increase of $2,585,809.

Record Price for Ferromanganese.—It was reported in Pittsburgh, Pa., recently that a carload of ferromanganese ,a steel alloy, was sold to a steel manufacturer of this district in the basis of $1,000 a ton, a record price. Before the war manganese was selling at $38 a ton. Another high price for steel material was recorded in the sale here of 2,000 tons of forging billets on the basis of $85 a ton Pittsburgh, a jump of $25 a ton from the last reported sale.

Fort William, Ont.—When the new elevators projected are completed and running, Fort William and Port Arthur will be only a few thousand bushels behind Chicago in elevator storage capacity. Chicago to-day is stated to have within her harbor borders, elevators that have a capacity of about 51,000,000 bushels. When the three big elevators here are running, the capacity will be increased by 5,500,000 bushels for the both harbors, or a total of approximately 50,000,000 bushels.

International Engineering Co.—International Engineering Co., of Amherst, N.S., which has been engaged in the manufacturing of munitions recently, reports profits of $77,778 for 1915. After allowing $34,492 for depreciation, writing off $3,625 on organization expenses,

Aikenhead's DUMORE GRINDER



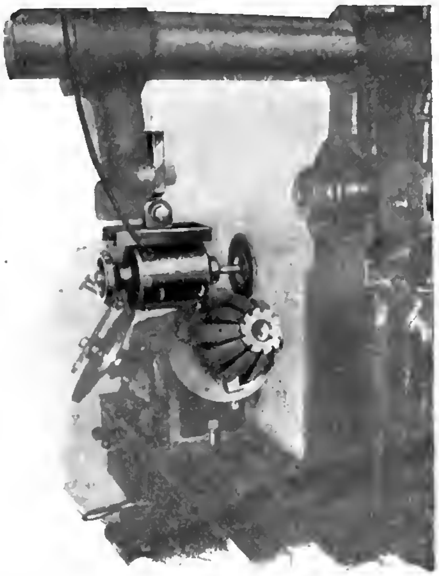
The DUMORE Portable Grinder. The only small grinder giving wheels the correct surface speed. Speed, 30,000 R. P. M.

IF you put a DUMORE Portable Grinder to work in your shop, you will quickly see a notable shrinkage in your grinding costs.

WHY?

It is portable—weighs but 17 pounds—easily carried from one job to another.

The DUMORE will do more and better work than the ordinary grinder. It saves time — and time means money.

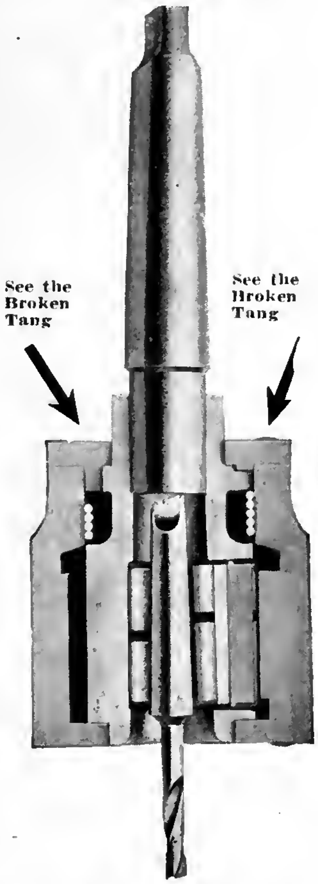


A rapid, practical way of grinding special milling cutters.

Aikenhead Hardware Limited

17, 19, 21 Temperance Street

TORONTO - - - CANADA



Don't Throw Away Broken Tang Drills

Perhaps you are about to discard some taper shank drills because the tangs are broken off —DON'T DO IT—they are worth their weight in gold. You can use them just as they are with a

Wahlstrom Automatic Chuck

One chuck holds drills from 1/16" to 1¼"

and you won't have to take time from your production to repair them.

Tool changes are made in two seconds—just grasp the shell of the chuck with one hand and put in or remove the tool with the other—no collets—no lost time, for the spindle never stops.

The jaws grip NOT BY THE TANG, BUT ON THE SIDE OF THE TAPER—there's no chance for slippage—a Wahlstrom won't even mar the shanks.

CANADIAN DEALERS:

Aikenhead Hdw. Co., Toronto, Ont., Canada
Williams & Wilson, Ltd., Montreal, Quebec, Canada

Wahlstrom Tool Company

350 Carroll Street Brooklyn, N.Y.

and paying $30,000 bond interest, the company had a net balance of $9,660 to carry forward. This reduced the debit in profit and loss account to $64,437. Orders on hand at the end of 1915 were $660,000.

Manitoba Steel Foundries.—With regard to statement which appeared recently in Canadian Machinery in connection with the Manitoba Steel Foundries, Ltd., and the Manitoba Rolling Mills, both of Winnipeg. We are advised that the Manitoba Rolling Mills will be interested in the Manitoba Steel Foundries and that the Steel Foundries' plant will be built alongside of the Rolling Mills. Only part of the Steel Foundries' products will be taken by the Rolling Mills, which concern is not the parent company of the Manitoba Steel Foundries as was originally stated.

Steel Rails May Advance.—What will mark a historic event in the steel trade in the United States is an advance in the prices of steel rails, which is confidently expected in trade circles to take place shortly. The base price of rails has stood at $28 a ton for more than 15 years, fixed at about the time the United States Steel Corporation was organized in 1901, and it has never varied. Judge Elbert H. Gary, chairman of the Corporation, has issued a statement saying that the rail-making subsidiaries of the Corporation would maintain present prices until May 1st, but would make no commitments beyond that date. Railroads lately have been breaking all precedents by placing their orders almost a year in advance.

Catalogues

Clipper Clippings for March has been distributed by the Clipper Belt Lacer Co., Grand Rapids, Mich. This number deals principally with the manufacture of canvas belts and a few notes on the Stewart-Warner Corporation plant where a number of Clipper lacers are used.

The Corbet Foundry & Machine Co., Owen Sound, Ont., have issued a catalogue dealing with the line of "Corbet" roller bearing trucks for railroads, factories, warehouses, mills, etc. The various types are illustrated and principal dimensions and prices are included for each size.

The Marvin & Casler Co., Canastota, N.Y., have issued Catalogue E, dealing with the Casler offset boring heads and boring chucks. These appliances, which can be used on lathes and milling machines, are described fully, while illustrations show the various styles of boring heads and the method of mounting for various classes of work. The cata-

logue also includes specifications and prices for the boring heads, boring bars, cutters and tools.

Book Reviews

Heaton's Annual.—The twelfth edition of Heaton's Annual published by Heaton's Agency, Toronto, has just appeared. There has this year been developed a section aptly entitled "Where to Find It." This is practically an index to the more important contents of the Dominion and Provincial Government Reports and Standard Publications relating to Canada. Every business man some time in the year says to himself: "Where can I find it?" and often spends days to find out. On the other hand, the Dominion and Provincial Governments annually spend hundreds of thousands of dollars in burying information alive in books and pamphlets, of which the general public never hear. Indeed very few people know of the valuable and interesting information which can be had for the asking. By referring to this section, the reader can at once put his finger upon the information which he wants and find the publications which contain it and the department to whom application must be made. As in previous years, the Annual contains official, bank, insurance, and legal directories, postal information, cable rates, the complete Customs tariff revised to date; a shipper's guide (covering every commercial town in Canada and giving the population, railways and banks), list of registry offices for deeds, chattel mortgages, etc.; up-to-date descriptions of every town in Canada, exchange and miscellaneous tables, and a mass of valuable general information, from which cross references are given to the section "Where to Find It" for the benefit of those who want further information. It would be difficult to imagine a book which fills its mission more completely than Heaton's Annual.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

FOR SALE—NO. 2 UNIVERSAL MILLING machine. J. A. Harvey, 16 Pearl St., Toronto.

SIX-FOOT METAL PLANER FOR SALE—practically new. Apply A. Graham Boyd, 100 Front St. E., Toronto. (14)

TWO FOX TURRET LATHES FOR SALE—splendid condition. Ideal Foundry, 960 Gerrard St. East, Toronto. Phone Gerrard 1055. (15)

1—2-SPINDLE SHAPER, WOOD TOP, JOHN Ballantyne, Preston, make. used two months. 1 Dynamo, 45 lights, Toronto and Hamilton Electric Co. make. Used five months. Good as new. Box 195, Jordon, Ont. (R.T.F.)

FORD-SMITH NO. 2 PLAIN MILLING MAchine; new; in perfect condition; ready for immediate shipment. McGregor & McIntyre, Ltd., 1139 Shaw St., Toronto. (16)

FOR SALE—FIFTEEN HUNDRED GALLON Duplex Steam Pump, used sixty days. Size twenty x twelve x sixteen stroke. Apply Fraser & Chalmers of Canada, Limited, Montreal. (12)

FOR SALE—GARAGE IN GOOD WHEAT district. Snap for a good, practical man. About forty cars in vicinity. Will sell cheap if taken at once. Address Box 74, Hanley, Sask. (13)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London, Ont.

1—C.G.E. TYPE 10—20 H.P. INDUCTION Motor—60 cycles, 220 volts, 45 amps.—1200 R.P.M., complete with Auto Starter. Pulley on Motor 12" Diam. x 10" Face. Cummer-Dowswell, Ltd., Hamilton, Ont.

IMPORTANT AUCTION

At Vancouver, B.C., of the Contracting Equipment formerly used by the

B. C. ELECTRIC RAILWAY CO. Limited

Originally Costing $250,000

On May 1st, 2nd, 3rd and 4th, 1916, By F. GRIFFIN & CO.

Including: 100 ton Baldwin Locomotive and Tender, Air Compressors, Mining Locomotives; Logging, Yarding and Stationary Engines; Hoists; Motors; Pumps; 24 Carriages and Chain Grates for Automatic Feed Stokers; 2 Lidgerwood, Panama Type, Cableways; Boilers; 40 Drills; Tunnel Bars; 25 Tons of Drill Steel; about 8000 feet of 11-in. and 16-in. Monitor Pipe and Fittings; Carload of Woodworking Machinery.

ON VIEW 25th April to date of Sale. Catalogues now ready, apply:

F. GRIFFIN & CO., Auctioneers

448 Seymour St., Vancouver, B.C., and 311 California St., San Francisco, Cal.

FOR SALE

Fox Monitor Lathe, 18" x 5' 6", 9-hole turret, cross feed, hollow spindle, 5-step cone; good as new. Plating dynamo, 6 volts, 250 amp.; used only a short time.

PENDRITH MACHINERY COMPANY
970 Queen St. West, Toronto (15)

FOR SALE

FOR SALE—PLANING MILL AND FACTory, doing good business. Terms $2,000.00 cash. Balance to suit buyer. Address O. Ribble, Bronte, Ont. (13)

AUTOMOBILE BUSINESS AND NEW Garage for sale. Overland agency; lots of repairing; also Overland roadster, new tires, $300.00; 10 light D.C. generator, $25.00; K.W. magneto (new), $15.00. W. E. Hawes, Otterville, Ont. (13)

FOR SALE—1 CLEVELAND ACME MAchine Co.'s 6" Cap, Single Head, Tapping Machine—back-geared, automatic feed, cone step pulleys and countershaft with two extra chucks. Particulars from Taylor-Forbes Company, Limited, Guelph, Ont. (13)

FOR SALE, AT A SACRIFICE—SAW MILL outfit, A1 condition; 50 H.P. stationary boiler. 45 H.P. "Leonard" engine, "Green" carriage, Simonds saw, edger, planer, lathmill, etc. Easy terms. Write quick. R. Parker & Sons, Uno Park, Ont. (12)

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double bandsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

ELECTRODES — THE PROPRIETORS OF letters patent No. 127080, relating to "Process of manufacturing iron for use in alkaline accumulators," and No. 127081, relating to "Active masses for positive electrodes of electric elements, etc.," desire to dispose of the patents or to grant licenses to interested parties at reasonable terms, with a view to the adequate working of the patents in Canada. Inquiries to be addressed to the actual proprietors, Svenska Ackumulator Aktiebolaget Jungner, Stockholm, Sweden. (13)

SITUATIONS WANTED

MECHANICAL SUPERINTENDENT, EFFICIency engineer and master mechanic having twenty years' experience in all lines of general machine, blacksmith, carpenter and pattern shop practice, foundry work, power plant, refrigerating and electrical engineering, is open for engagement. Box 177, Canadian Machinery. (11)

CHIEF ENGINEER — 26 YEARS' EXPERIence. Factory and Central Station, Alternating and Direct Current, Gas or Steam Engines, efficiency guaranteed, own instruments, best of references. Box 181, Canadian Machinery. (12)

AS MAINTENANCE ENGINEER OF FACTory, power or lighting plant, where economy is a factor, wide experience, best of references. Box 180, Canadian Machinery. (12)

WANTED

Burned out Tungsten Lamps, late type, drawn wire, 25, 40, 60 and 100 Watts, 110 and 115 volts.

DOMINION TUNGSTEN LAMP FACTORY
ST. CATHARINES, ONTARIO

REPAIRING

ALL KINDS OF MACHINERY REPAIRED, rebuilt and installed. W. H. Sumbling Machinery Co., 613 Yonge street.

SITUATIONS VACANT

WANTED—YOUNG MAN TO HANDLE ADvertising of a line of engineering equipment. Must be prepared to locate in a city of 15,000 population. Salary to start, $70 per month. Box 184, Canadian Machinery.

WANTED — MACHINISTS AND FLOOR hands on heavy and miscellaneous medium work; steady employment, modern shop, good wages. Apply, stating age and experience, P.O. Box 6, Walkerville, Ontario. (6)

WANTED

WANTED TO RENT — SMALL MACHINE shop, two or three small lathes, miller, drill, motor, furnace, usual small tools. Full particulars and terms. Box 179, Canadian Machinery. (13)

WANTED — TWO FIRST-CLASS STEEL moulders. Apply Nova Scotia Steel & Coal Company, Limited, Sydney Mines, N.S. (15)

WANTED—OUTSIDE MACHINIST TO ACT as mechanical foreman on construction work. Apply to A. B., Canadian Machinery. (15)

WANTED — YOUNG CHEMIST WHO HAS had some experience in analysis of iron, steel and other steel plant products. Apply to X. Y., Canadian Machinery. (15)

AGENTS WANTED

BRITISH HOUSE MAKING SYRINGES AND spraying machines for every possible use, need Canadian agents. The line is the most complete in the world and includes knapsack and ordinary spraying machines for fruit growers, limewashing machines for farms, factories, etc. Disinfecting machines for all purposes. Anything in the way of spraying and washing machines made to suit the market. Agents must be aggressive and ready to work the line thoroughly. Write: Spraying Machines, c/o Canadian Machinery, 143 University Avenue, Toronto.

Typical Canadian Munition Works Producing Shells

Staff Article

Ample floor space, good light, convenient transportation facilities, and provision for future adaptability to widely varying lines of engineering work are prominent features of the factory described in the following article. The thoroughness of the present arrangements accounts for the satisfactory results at present and augurs well for the success of future efforts.

AMONGST the many new factories whose existence is directly due to the widespread activity occasioned by the demand for war supplies there are many which evidence a far-sightedness on the part of the proprietors which augurs well for the future industrial career of this country. Many of the so-called mushroom concerns were by the nature of events compelled to avail themselves of just such accommodation as could be got, as it was not the policy of concerns of this nature to make any unnecessary investment in property or other possessions which were not acquired with a view to permanent possession.

Many formerly established concerns, however, were convinced that judicious expenditure in shop extensions would be ultimately profitable as well as being instantly desirable. The views which are reproduced along with this article illustrate the interior of a shell factory in this country which has produced many thousands of shells since the war commenced. The sound judgment shown in the design and construction is evidenced by the similarity of its arrangement to that of one of Britain's new arsenals several views of which we were recently enabled to publish.

The two illustrations on this page illustrate about one-sixth of the total space covered. All of that space represents an extension to a previously existing shop of considerable size in which the shell manufacture was started and continued until the continual recovery of domestic business made it necessary to find new quarters for the shell work. The addition of this new space, while relieving the old quarters and facilitating present production, affords welcome guarantee against lack of shop facilities when competition resumes its normal course and the race is to the well equipped rather than the swift.

The upper view shows part of one bay just after completion and awaiting the installation of the machines. The lower view shows the machinery installed and producing 18 pdr. high explosive shells.

Particular notice will doubtless be taken of the substantial steel framework which separates the bays. This was designed to insure maximum efficiency in the transmission of power from the numerous group drive motors, and enable its distribution to the various machines to be arranged in the most convenient manner and yet be easily adaptable to any new tools or rearrangement of machines such as might be occasioned in the future. A study of the countershaft arrangements will enable this feature to be appreciated. The countershaft battens are not bolted to the lower horizontal beams of the steel framework, but are tightened by clamp bolts so that their position can be adjusted as often as desired. The battens may be clamped on the top, bottom, or sides of these beams, which possess ample strength to resist any tendency to twist when the combined pull of numerous belts comes on.

VIEWS SHOWING SHELL FACTORY INTERIOR BEFORE AND AFTER INSTALLATION OF MACHINERY.

In common with most shell making concerns, this firm was not enabled to select its equipment as thoroughly as would have been done under ordinary conditions, but in spite of circumstances a fair degree of uniformity in size and type of machines was obtained. On the right of the lower view, page 341 can be seen seven W. P. Davis turret lathes recessing the bases to receive the base plugs, while a well balanced selection of C. M. C., Reed, and Bradford lathes are employed on body turning and thread waving at the left of the picture.

The arrangement of motors for group driving is seen here, each 30 horse-power motor taking care of a shaft half the length of the shop. By placing each motor in the next bay to its shaft, a suitable degree of inclination is given to the driving belts.

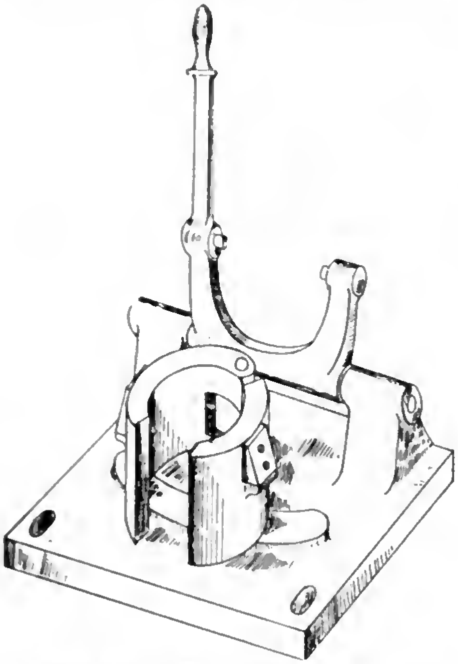
The third view shows the milling department where threads are milled in the nose and base, after which the copper band is put in position and machined, base plug screwed home, rolled, and faced off to dimension. The thread-milling machines are of the duplex type and were developed by this firm in its own shop.

After various inspections, weighings and washings, the shells pass to the paint shop, where they are lacquered and baked, afterwards being painted the regulation yellow color with a green band round the body. The last view is

taken in this department, the two operators in the foreground being engaged at a Fairbanks-Morse painting machine which revolves a number of shells simultaneously and also can be turned around while working so as to allow shells to be put on and taken off systematically.

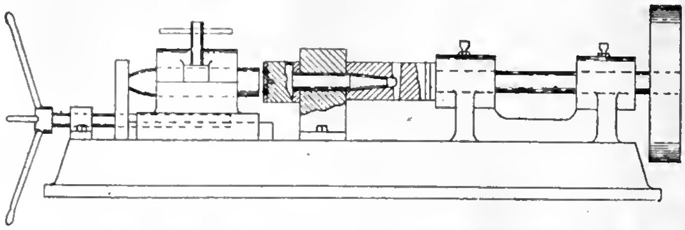
Numerous home-made devices can be noticed around most shell shops, all more or less similar, but occasionally showing a feature of more than passing interest. The rough billets in this shop are first centred in a drill press and a self-centering vise was developed which is rapid and accurate. The sketch herewith is self-explanatory. Another very effective device noticed was that used for closing up the threaded joint between the base plug and the surrounding metal.

TYPICAL VIEW OF SHELL FACTORY.



SELF-CENTERING VISE FOR HOLDING SHELL BILLETS.

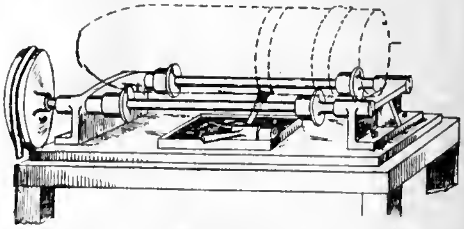
In this plant recourse was had to rolling and the simple machine shown in the accompanying sketch has proved very satisfactory for this work. The shell is placed in a hinged vise clamped together with a hinge bolt and sliding on suitable vees on the top of the bedplate. A feedscrew with lever handles is mounted on the end of the bedplate and forces the shell base against the rolling tool on the hardened face of which are three large hardened steel balls held in place by a retaining plate. The diameter of the ball race corresponds to that of the base plug, and a few seconds pressure of the shell against the balls while they are revolving at a medium speed suffices to compress the metal in the region of the joint equal to any result obtained by riveting.



MACHINE FOR ROLLING BASE PLUGS IN POSITION.

While the matter of painting the shell itself has been well taken care of by a number of machines on the market, the question of painting the band round the middle has been frequently left to the man on the job: the work involves locating the position, and width, and avoiding any spreading of the colour over the body of the shell. The last sketch shows a simple contrivance which puts the band on correctly. The shell rests on two pairs of discs carried by two shafts mounted in a simple frame work. The copper band rests on the discs at one end of the machine, which is slightly inclined so that a shoulder on ridge on the band acts as a flange against the discs and causes every shell to assume the same position. Underneath the shell a small pan with green paint is fixed and a brush of the proper width is hinged in position so that it can be swung down into the paint and then elevated against the body of the shell, painting the green band of the proper width and in the proper place. The device is mounted on a small bench with motor drive which allows of its being moved to any part of the floor to suit the progress of the work.

LACQUERING AND PAINTING SHELLS AFTER MACHINING.



DEVICE FOR PAINTING STRIPE ROUND SHELL.

The Society of Electrical Development will hold its fourth annual meeting at the executive offices in the United Engineering Societies' Building, New York, on May 9.

The Turbine Equipment Co., Ltd., Toronto, Ont., have been awarded a contract by the Board of Water Commissioners, Collingwood, Ont., to supply and instal two De Laval single stage centrifugal pumps, each having a capacity of 1,000 Imperial gallons a minute, against 165 feet head, and each direct-connected to a 75 h.p. Canadian Crocker-Wheeler motor, complete with valves, piping and venturi meter.

Limit Gauge Principles and Practical Applications--II.*

By W. H. Booth, F.G.S.

As the author aptly remarks, there exists a real lack of grasp of the purpose of limit gauges, even although more or less appreciation may be evidenced by the great bulk of operatives that interchangeability of parts of a particular mechanism being manufactured is an indispensable condition. The writer deals with the various phases of the subject in such a way as to brush aside much of the mystery surrounding limit gauges generally and as will make their service application less irksome, as well as more effective of purpose.

OBVIOUSLY, a gauge can never be accurate in itself. If a piece of work is to vary plus or minus .01 in., the gauge will have a size say, 1.99 and 2.01, but how much may the gauge vary from the nominal size? Let us suppose one-tenth of the work variation. Then, the above gauge may be accepted if at one end it measures 1.99 plus or minus .001, and at the other 2.01 plus or minus .001 — That is to say, 1.991 or 1.989, and 2.011 or 2.009.

Some mechanics prefer to make shop gauges with finer limits than inspection gauges to the extent of 25 per cent. This is a concession to the weakness already pointed out of hugging closely to one limit. It is a charge, of course, upon the limit system which represents labor inefficiency. With fully skilled men, the shop gauges need not be different from the inspector's gauges, and the system will not fail.

Screw Gauges

It is very difficult to make screw gauges which shall be correct by absolute measurement of their screw dimensions. These are the pitch of the thread, the top diameter of the thread, the bottom or core diameter, the so-called effective or mean diameter, the angle of the thread, and the top and bottom rounding. If one of these varies, all the others may vary except the pitch. Thus, if the top and bottom of the thread are of too small a radius the thread will be found to possess too wide an angle, or it will be too deep, and the core diameter will be small. By drawing a thread, the differences due to change of any dimension may be followed out. If the lead screw of a lathe is not evenly pitched, this fault will reappear in the thread it cuts, and if the end-bearing abutment of the lead screw has faces not square by the longitudinal axis of the screw there will be a slight to-and-fro motion which will reappear in a periodic variation cycle of the work done.

The only practical way to make screw gauges, except by special care, is to make them so that they pass in or on the work done, so that the work is an average fit on the check gauge. A check screw gauge is really a carefully made bolt or nut of fine finish, but it is not an accurate piece of work, but merely an average approximation. Like many engineering compromises, however, it is good enough to accomplish good work, and to maintain work up to a sufficient standard of excellence and interchangeable, except in special cases.

Essential Dimensions Factor

In getting out gauges for any piece of work, it is necessary to regard the object to be made from the point of view of its essential dimensions. These must, of course, be made to gauge. It will happen that some essential dimensions will be fixed by others, and in such a case there is no object in multiplying gauges. The parts of work to be done may sometimes be capable of very wide limits. It is not usually desirable, because of this, to mark limits which are too wide. Work that is to rough may present as many difficulties as work that is too fine. It is easy to err in the direction of supplying too many gauges, but no important dimension should be omitted. However, purely for the sake of providing a gauge, it is undesirable to make parts very closely to a given size; thus an oil hole would be figured 3-16 in. —not with a limit H.0187 L.0190—for there is no call for greater accuracy than what a nominally 3-16 drill can provide.

Work Cost Feature

The limit principle is quite wrongly applied when it involves an addition to the cost of work. Properly devised, and properly worked to, a sufficient application of the principle will cheapen work. If a diameter is wanted; say, 2 in., and there is a top limit of 2.001, the workman who insists on working accurately to 2.001 shows that he has not grasped the principles involved. If the work were wanted exactly 2 in., it would be as easy to make it exactly 2 in., as to make it 2.001. Obviously, therefore, it is waste of time and money to endeavor to work to the one limit instead of aiming to hit anywhere between limits.

I have met many men, who, when given a size 2 + .0007 have made the piece 2.00071, so as not to be too small, but what was really wanted was 2.0000, and what the workman was expected to give was 2.0002 to 2.0005. He would try to reach an exact 2.0007, whereas he had better have made it exactly 2.00 than 2.0007. The war has made many men acquainted with the limit system who did not know it before, and it has shown —what is of universal experience—that it is practically impossible to get new men to aim at the happy mean. Work has, therefore, not been much cheapened as it should have been, and as it will be when men grasp the principle involved.

Limit System Limits

Like everything else, the limit system has its limits. For extremely accurate work a man must work to a fixed single dimension gauge, or to the best he can do with a micrometer. It is in commercial work that the limit system finds its best field. By the use of the limit gauge system it is possible to have a dozen factories at work in all parts of the world making one product, such as a machine built up of many pieces. Any machine requiring repairs may be supplied with new parts, which may come from any one of the dozen factories, yet will be truly interchangeable. It is only on limit lines that such things are possible, and when an interchangeable system is properly carried out, and manufacture embodies limit gauges, it becomes possible to sell the product at a low figure, and at the same time reap large profits.

Screw Gauge a Knotty Problem

There is a prevalent idea that it is necessary for the top of the screw to make actual contact with the bottom of the nut threads. How else, for example, can a steam thread be tight? Steam would escape round the spiral space. Steam threads, however, are always put together with some kind of red lead, or iron oxide paint, and steam will not escape by the long circuitous spiral.

Now, is it humanly possible to make threads to fit on the little curves which join the slopes of the threads at the top and bottom? As a matter of personal opinion, the author sees no objection to the removal of the rounding of the top of the thread—that is, of the rounding of the threads at the larger diameter of the plug, and at the smaller diameter of the ring gauge—and would do the same with the work itself, thus eliminating two of the most difficult of the seven dimensions from the field of work. This would greatly facilitate matters, and would detract nothing from the strength of the thread. The suggestion is put forward purely as a matter of personal opinion, and as a practice the author would not hesitate to carry into effect in any commercial manufacturing undertaking.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

MANUFACTURE OF SMALL SHAFTS

By F. H. Mayoh

THE production of small shafts in quantities is a line of work frequently met with, and in most shops, the methods employed have a

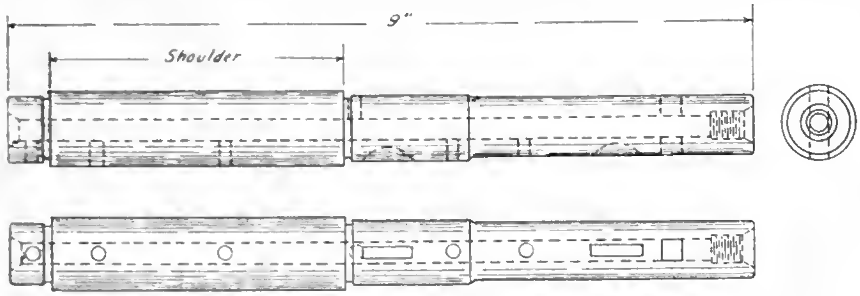
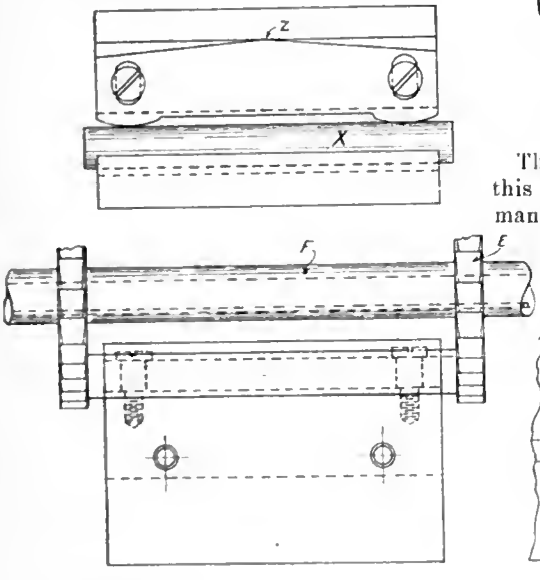


FIG. 1. SHOWING DETAILS OF WORK ON SHAFTS.

general similarity. The shaft referred to in the following article has some features rather different from the regular run of this work. It is made of steel tubing in place of being solid and this fact necessitated the making of several jigs and fixtures to enable rapid and accurate work to be produced.

Preliminary Operations

The tubing is first cut off to length, including about ⅛ in. allowance for finishing ends. The piece is then placed in a vise, see Fig. 2, and straddle-milled to an exact overall size. This is done to insure uniformity in the subsequent operations, which are based on the



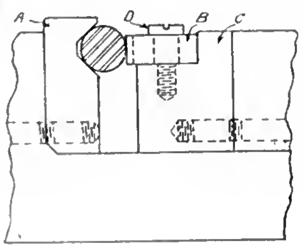


FIG. 2.

countersinks in each end of the shaft. As these countersinks are machined in relation to each end of the shaft, it follows that the ends of the shaft must be accurately machined in relation to each other.

When the ends are being milled the blank X, Fig. 2, is held securely in a vise by a V-jaw A, and equalizing jaw B. The latter consists of two pieces, viz., the jaw proper C, and the equalizer B, which rocks on the point Z, and is held in place by the screws D. The object of the equalizer is to take up any variation which may occur in the diameter of the shafts. The cuts across the ends are taken by the cutters E held on the arbor F, shown in the illustration. The work is performed on a horizontal milling machine.

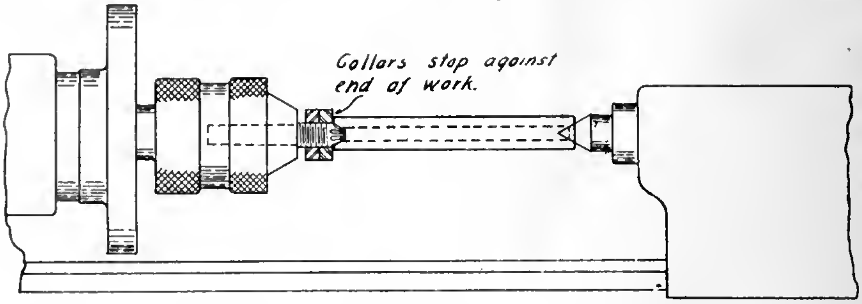


FIG. 4.

The next operation is countersinking, this being done on a speed lathe in the manner shown in Fig. 4. One end of the work is held in the tailstock centre, while the opposite end is countersunk by a special countersink reamer, with collars on it, placed in the headstock. The work is prevented from turning by gripping the shaft with the hand. To return to the construction of the countersink the collars are set to give the correct depth for countersinking; the work being countersunk until the collar comes against the end of the work on both ends of all pieces.

Fig. 3 illustrates the manner in which the work would be affected through irregularity of countersinks, the end of the shaft being subject to variation in position as shown, according to depth. As subsequent fixtures and tools are set in

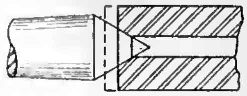


FIG. 3.

relation to the centres which support the work, the impossibility of getting accurately duplicated pieces with non-uniform countersinks will be readily seen.

Turning and Necking

For the fifth operation which is turning the four diameters no special tools were provided, and the method of turning was left to the discretion of the foreman on the lathes who used the best type of lathe available at the time, for the work in hand. The only restrictions placed upon him being grinding and squaring up the shoulder with a necking tool which is taken care of by the next operation. The work is supported between the lathe centres, the lathe being provided with a square tool box in which is held the two tools. These are accurately spaced so that in operation the desired result is obtained by merely feeding the cross slide in to the required depth.

Cutting Keyways

Following a burring operation in which the sharp corners are removed the next operation is performed, which consists of milling the two key-ways Z. Fig. 5, by holding the work X between centres and cutting first one key-way

and then the next with a Woodruff cutter; the object in milling before drilling being that it was desired to locate from the key-ways, for the drilling operations.

Tapping

It will be noticed by referring to drawing of the part Fig. 1, that a hole is tapped at one end and as the hole had to be drilled out slightly to the tapping size and counterbored slightly for starting the tap a simple jig was provided for holding the work as shown in Fig. 6. This jig consists of two vees A and B, in which the work is set. A plug C, on which the work rests, is provided, and also a screw D, with shoe E on it to hold the work in the vees. To prevent the work from turning, a pin F, is provided which fits into the key-way previously milled. As the point of the drill will follow the countersink no drill bushing is necessary. This jig is incorporated in a suitable frame G, which rests on the drill press table. The drilling operation is followed by tapping out the hole and as these operations throw a burr into the hole which would cause the shaft to run out of true were the shaft placed on centres, the next operation consists of removing this burr.

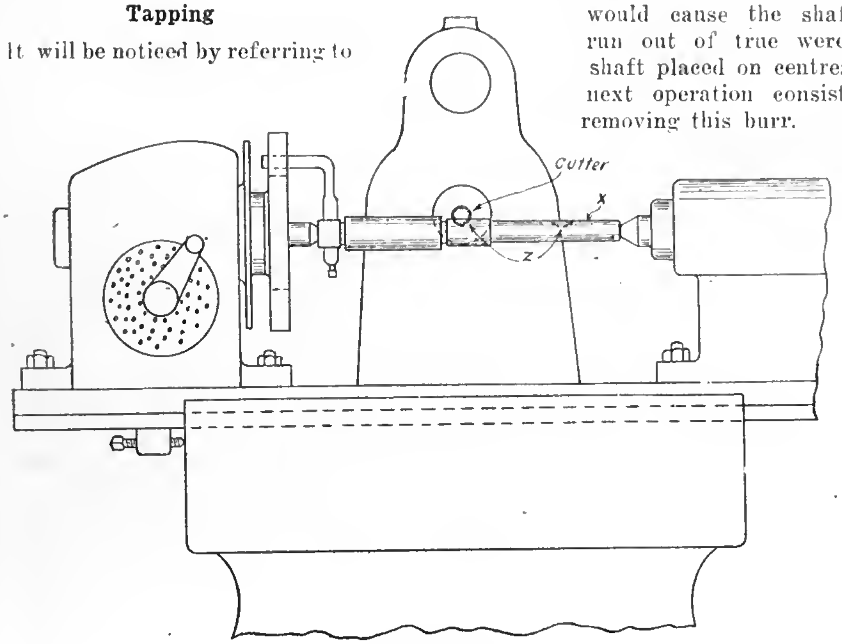
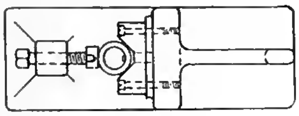


FIG. 5.



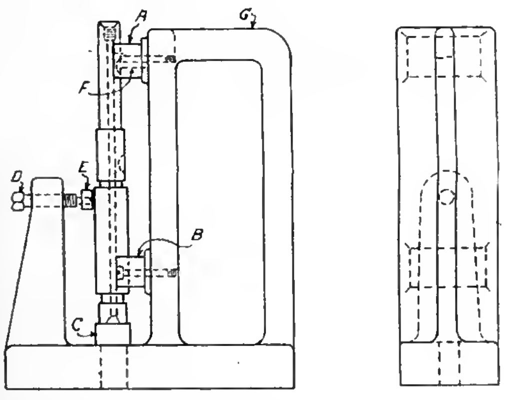
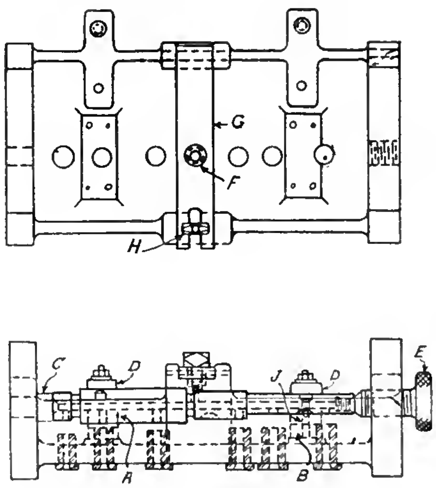


FIG. 6.

Drilling

Next in order is drilling; all the small holes being drilled in the jig shown in Fig. 7, which consists of, as in the previous jig, two vees A and B, a plug C and has in addition to these, two clamps D, for holding the work in place, and a screw E, to locate the work against the plug. For drilling the holes the jig is turned over and the various holes, including the starting hole for the square broached hole, are drilled through the bushings along the bottom while the one hole which is in the opposite side of the shaft is drilled by having the drill guided by a bushing F, in a hinged cover G, which is locked in place by the quarter turn screw H.



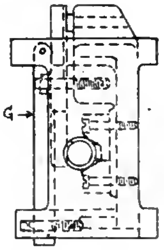


FIG. 7.

It will also be noticed that a flattened pin J, which fits in the key-way of the shaft as mentioned before, locates the work in the jig, and the holes in relation to the key-way.

Broaching

As a broaching machine was not available, an arbor press was employed for using the fixture and broach shown in Fig. 8. The shaft was supported in the two vees A and B. The broach C, was then dropped through the square bush D, the locater X, entering the hole

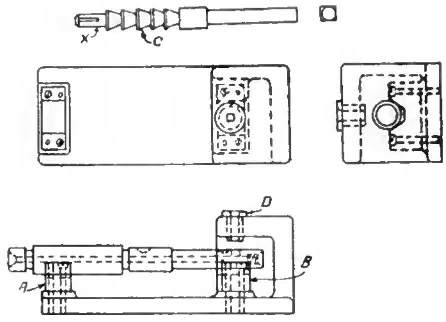


FIG. 8.

previously drilled, thus effectively locating the work in place. The fixture with the work in position, was placed beneath the ram of the arbor press and the square broach forced through.

After all the sharp corners and burrs are filed off, the work is ready for hardening, grinding and inspecting. Lastly, as the shafts are made up in lots they are greased to prevent rust and stored away to be used as desired. This method of handling insures an interchangeable manufacture of the shafts in a simple and practical manner with only a moderate outlay for special tools.

The Consolidated Mining & Smelting Co. has started construction of a plant of Trail, B.C., for the manufacture of sulphuric and hydrofluoric acid, which is expected to be ready for operation in two months. A site is also being cleared for a copper refinery, and the existing lead refinery will also probably be extended. The new plant for the manufacture of zinc is now in operation, though shipments have not yet commenced. The copper converters now in course of installation are nearing completion, and should be working shortly.

Standard Type Lathes Equipped for Large Shell Production

Staff Article

The increased output, the relatively small first cost, quick delivery and ultimate depreciation of special purpose machines, influenced their rapid adoption for small shell production. The more skilled help required for operating large machines of the type described here, with longer life and more equality in output, price and delivery have been to a great extent responsible for many machines of this type being put into use recently.

THE demand for machine tools during the earlier stages of shell manufacture was so wide-spread and urgent that shell-makers were frequently supplied with what at best were mere approximations of lathes, boring machines, etc. The experience gained on the smaller sizes of shells was, however, continually turned to account in producing the larger sizes, which, coupled also with the fact that shell construction was considerably simplified in the larger sizes, enabled ample preparation to be made by Canadian tool-builders in anticipation of large calibre shell production. The John Bertram & Sons Co., Ltd., Dundas, Ont., were particularly well fitted to produce machine tools for medium large shells, their long experience in heavy tool building placing them in a favorable position in regard to suitability of design and promptness of delivery.

Single Purpose Equipment

We illustrate herewith two lathes, built by them for handling shells up to 12 in. dia. These tools are both built from standard patterns of a special type of powerful lathe, with 12 ft. bed to be used ultimately on a particular line of manufacture. Their present equipment is of a simple but specialized nature, each lathe being adapted for performing a single operation in the least possible time, with the greatest accuracy and ease of duplication.

Figs. 1 and 2 show the front and back views of the lathe equipped for turning the body and forming the profile simultaneously. Duplex carriages are fitted, the hand wheels and levers being arranged symmetrically on the aprons as shown. The long hand-levers at the outer ends of the carriages are coupled by rods to the revolving plates which operate split nuts to engage the feed screw shaft. These plates, situated immediately below the crossfeed hand wheels are held in the engaged position by catch levers which can be thrown out when desired by hand, or disengaged automatically by adjustable stops carried on the stop rod which extends along the front of the bed.

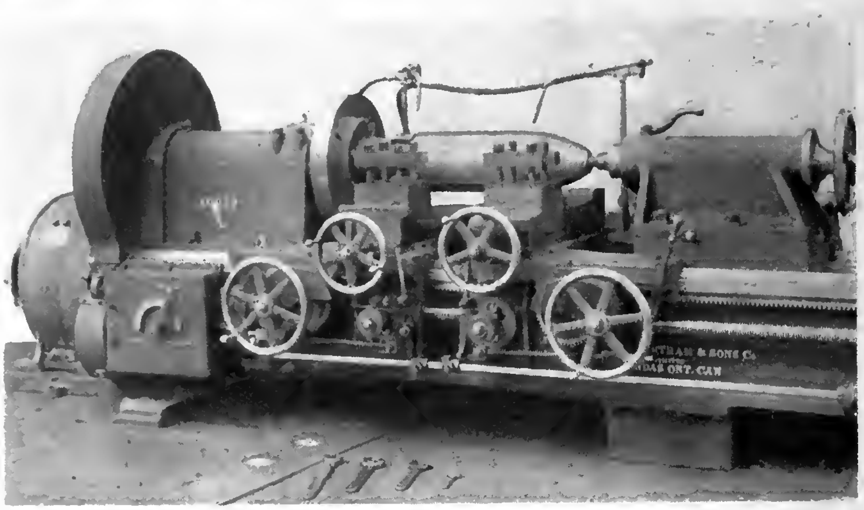


FIG. 1. TURNING THE BODY AND FORMING PROFILE OF 9.2 IN. SHELL SIMULTANEOUSLY

Profiling Mechanism

The profiling gear is of the radius link type, and is designed to operate with the tool traveling toward the right. The manner of taking the cuts and the action of the mechanism will be understood by referring to Figs. 3 and 4. Tools A and B are secured to the parallel and the radius turning carriages respectively being set half the length of the shell apart. The radius carriage is provided with a slide C at the back on which slides the bracket D, carrying the centre pin for radius link E, which in turn is connected at its forward end to the slide carrying tool B. When tool B travels slightly to the right as shown by dotted outline, it reaches the beginning of the curve; at the same time the end of bracket D comes against stop pin F, which causes the back end of link E to remain stationary while the forward end swings around and causes tool B, to travel in a circular path as shown. By this time tool A has traveled up to the starting point of tool B completing the work.

Resetting Tools

When returning the tools to the starting point, it is necessary to hold bracket D in contact with stop pin F, until link E has returned to its original position. This is done automatically and positively by the arrangement shown in Fig. 4. Three elevations of the mechanism are shown; (a) with the carriages in position commencing the cut, the rod G being kept from engaging with catch H by the cam J underneath lug I; (b) shows slide D in contact with stop pin F and rod G engaged with catch H: (c) shows the rod still engaged but the carriage has now reached the end of its travel, see position of cam J. By following the illustrations in the reverse

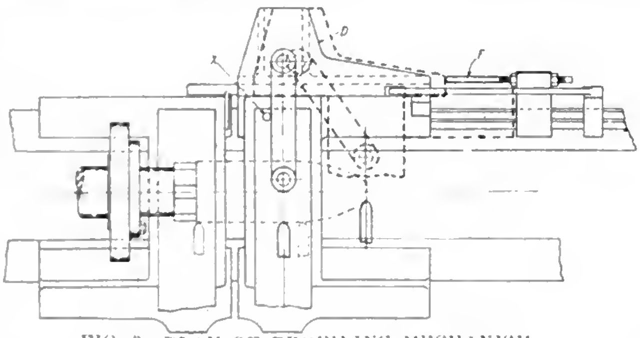


FIG. 3. PLAN OF PROFILING MECHANISM.

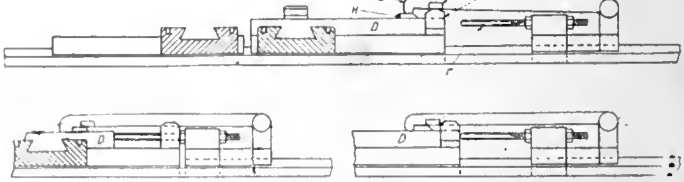


FIG. 4. SHOWING OPERATION OF LOCATING DEVICE IN FIG. 3.

order, it will be seen that bracket D is positively anchored in position until the carriage has resumed its original position in relation to it.

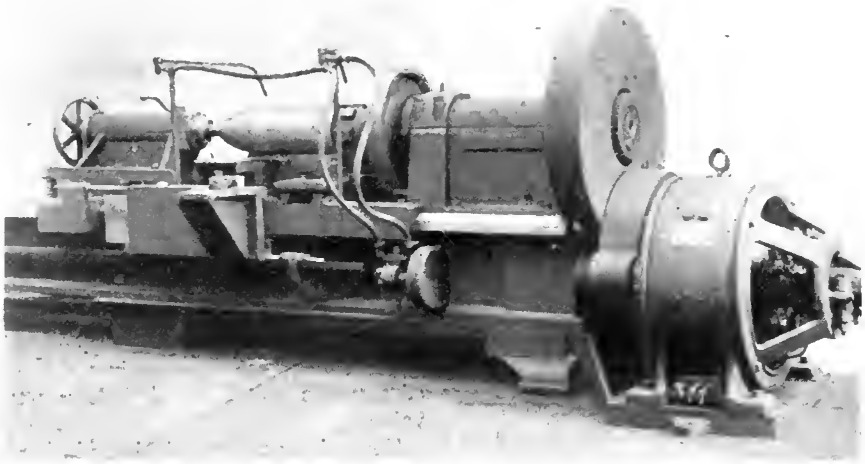


FIG. 2. REAR VIEW OF LATHE SHOWING LINK MECHANISM FOR PROFILING.

The travel of tool B to the left is limited by a stop on the back of the bed, Fig. 2, acting through bracket D and the stop X at the side of the radius link.

Driving the Shell

The shell is driven by the open end or base which is slipped over an automatic expanding arbor with a single set of three driving dogs separated by a sleeve. This sleeve is formed with a large hub having spanner notches. As the sleeve is turned backwards it causes the dogs to move across the inclined faces of three grooves, which expand the dogs against the inner surface of the shell. Any further backward movement of the shell automatically tightens the grip of the dogs. Release is obtained by slackening the sleeve forward so as to slide the jaws to the deeper part of the grooves. The nose end of shell at this stage is solid and is supported by tailstock centre.

Electric drive is provided from a 25 horse-power 2 to 1 adjustable speed motor, operating through double reduction spur gearing. The pump system is very complete with individual pipes of large capacity, a circulating drain tank being provided in the centre pedestal supporting the bed.

The machine which is shown operating on 9.2 in shells, weighs 15,000 lbs., and performs the rough turning operation in about twenty minutes.

The photographs reproduced in Figs. 5 and 6, show a lathe of the same size and pattern specially equipped for grooving and waving. In this case the feed screw is omitted, but the traversing rack is used for adjusting the carriage and the tailstock. A plan view is shown in Fig. 7, from which the details of operation will be more clearly obtained.

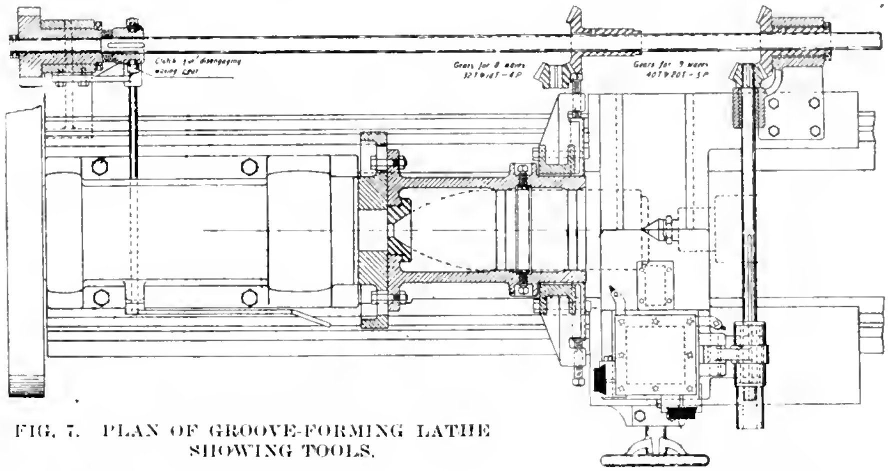


FIG. 7. PLAN OF GROOVE-FORMING LATHE SHOWING TOOLS.

The shell is held in a pot chuck bolted to the spindle face-plate, the outer end of the chuck being supported in a steady rest. The inner end of the chuck contains a bushing formed to fit the nose of the shell which is thus centred while the base of the shell is fitted with a service plug to receive the tailstock centre. When thus accurately positioned, the shell is clamped in the chuck by six set screws which tighten on a spring ring to protect the finished surface from damage. The tailstock centre is retained in use to counteract the side thrust of the tools.

The tool box is of the square revolving turret type and carries four tools for grooving, undercutting each side separately, and waving.

Waving Mechanism

Chief interest attaches to the waving mechanism. In the case of the small sizes of shells, the lathe carriages were comparatively light, and no vital objection could be found against oscillating the carriage as a whole, especially as circumstances were urgent, but the problem of imparting a rapid reciprocating motion to a heavy carriage on a lathe of this size was altogether different. The desirability of quickly altering the number of waves when desired also required consideration, hence the adoption of a shaft drive along the back of the lathe to a cross-shaft mounted on the carriage, operating the tool box only, in a separate slide parallel with the shell. This cross-shaft is grooved to engage with a feathered eccentric which allows the tool slide as a whole to be moved to or from the work as required.

The dangers attendant on the projecting end of the cross-shaft have been guarded against by the provision of a sleeve of sufficient length to keep the shaft from protruding when the tool slide is at its furthest in position. The oscillating motion is conveniently disen-

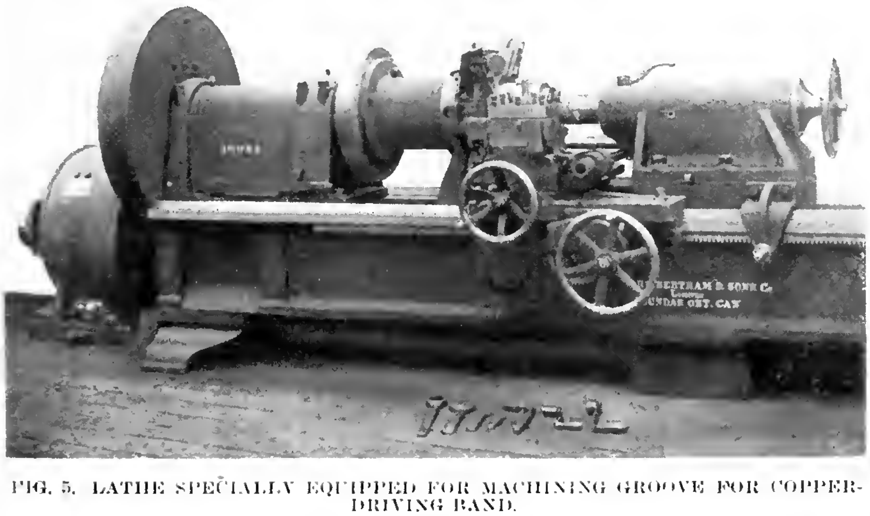


FIG. 5. LATHE SPECIALLY EQUIPPED FOR MACHINING GROOVE FOR COPPER-DRIVING BAND.

gaged by a dog clutch on the rear shaft, operated by the hand lever on the front of the headstock. By running the carriage far enough to the right hand, the bevel gear on the rear shaft can be easily removed and a different ratio substituted to cut any required number of waves.

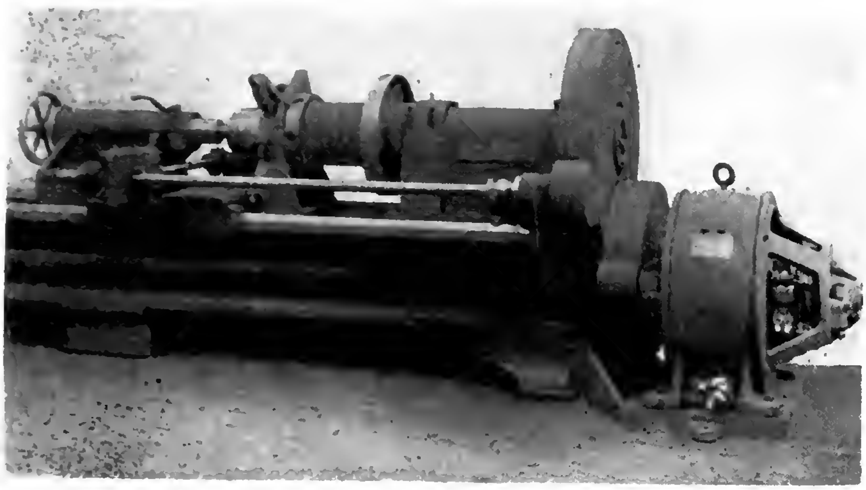


FIG. 6. REAR VIEW SHOWING SHAFT DRIVE TO WAVING MECHANISM.

OUR FUTURE METAL SUPPLIES

THAT the present feverish activity in metal production is viewed with considerable misgivings by mineralogical authorities is evidenced by an analysis of the present situation by Donald M. Liddell in the Engineering Magazine. Salient facts are stated in plain language and the anomalous features of current events in their relation to future metal supplies are elucidated in an article dealing with those metals of greatest economic value to mankind.

Tin, lead, copper and zinc are four metals which have been known to man from earliest times and with the exception of zinc, whose history as a pure metal is only 300 years, have all entered in the numerous activities of man right down through the ages, yet, as mentioned by Mr. Liddell:—"Three thousand years have gone, and tin is still so scarce that in a few months, as in 1913, the machinations of a Jewish-Chinese syndicate can send the price up by twenty per cent. The tin going on our tin cans, which is the bulk of the output, is now almost totally lost. With what the metal receptacles for food of a decade hence will be lined, is already a problem."

The destructive consumption of lead, copper and zinc is akin to that of tin. Although lead production was carried on by the Egyptians and Romans, the world's accumulated stocks of 5,000 years seem powerless to help us. "How can they, when every rain washes lead paint from the houses into the ground in a form too disseminated even to be regained; when every soldier fires away a portion of the world's stock, when almost every coffin carries a lead lining; while lead pipes or lead joints in iron pipe corrode in the ground; and when every plumber's apprentice throws away lead dross; and tea is packed in lead foil? In the meanwhile, the use of lead in storage batteries adds another possibility of loss. The sludge from these batteries will usually be thrown away when the cells are cleaned. And so the new discoveries of science help to add new methods of waste."

Recent increases in copper production have been offset by increased consumption, much of it in an irrecoverable manner—shells continue to carry their copper bands, the trolley wires of the world are subject to a startlingly rapid abrasion, all going to irrecoverable dust. "Zinc has only been available as a pure metal during the last 300 years, and 20,000,000 tons are estimated as being produced in the last forty years. Yet, as with lead, every rain washes an appreciable amount of zinc paint into the ground, cartridge cases require zinc as well as copper, and every salammoniac electric battery renders some zinc commercially non-existent. So too innumerable miles of barb wire fences, and unaccountable acres of galvanized sheets and pipes, waste zinc that iron may be preserved."

Passing over the writer's references to precious metals, his remarks regarding bituminous coal, lignite and iron ore, are limited to the statement that deposits of these minerals are estimated at from 600 to 1,200 years. "Yet this is short compared with the known duration of metal-using man . . . mineral deposits do not grow by sensible increments. And in the meanwhile, every railroad rail, car wheel and brakeshoe is wearing away, and wherever man sets his foot, iron is flaking off through insidious friction.

The two great indestructibles of our school days were matter and energy. They were the immortals. Perhaps, but there are at least degrees in energy. Lord Kelvin postulated that in every transfer or transformation of energy, a certain part was set free as thermal energy, and apparently looked forward to a universe in which all force had been uniformly distributed as thermal energy —a dead level, from which nothing could ever raise itself by its calorie bootstraps—a universe all at one temperature.

Matter likewise has its degrees. Iron-ore deposits are valuable because they are comparatively pure. An earthy crust, neatly mixed, containing in every cubic centimeter the same percentage of silica iron, gold, and tin as the present crust does in its more or less segregated deposits would be of little practical value.

Toward such a find degradation of matter man's best efforts are tending."

SEPARATING SILVER FROM PLATINUM WASTE

THE entire waste is cut into small pieces and heated to redness to destroy grease and organic substances) and then dissolved in aqua regia (3 parts hydrochloric acid, 1 part nitric acid). The platinum and all metals combined with it are thus dissolved, but the silver, as chloride, in the form of a gray, spongy powder is deposited. The solution is then drawn off, tested for the possible presence of gold, which by means of oxalic acid is precipitated as a fine, yellowish powder. The other metals remain unaffected. The platinum still present in the solution is recovered by gradual addition of salammoniac, as a yellowish gray powder. These different precipitates are washed out with warm water dried, and with the aid of suitable fluxes transformed into the metallic condition.

Platinum precipitates must, however, first be purified, and for this purpose must be first heated to redness. Then any steel or iron fragments present are extracted by means of a reagent, the remainder immersed in concentrated sulphuric acid and heated with it as long as any action of the sulphuric acid is noticeable. The remaining powder is then pure platinum.

Hot sulphuric acid dissolves silver without affecting the platinum. The fluid employed for the separation of the platinum is then diluted with an equal quanitity of water and the silver precipitated therefrom by means of saturated solution of common salt, the salt solution being slowly added until no more separation is apparent. The fluid is then carefully drawn off (filtered off), the residue washed out in warm water, dried and with some soda to act as a flux, is melted down into pure silver.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

THE FOUNDRY AND THE WAR

By R.C.G.

DURING this busy season when all those employed in the mechanical arts and industrials are engaged in turning out shells, cartridges or something for the Imperial Government, very little is being said about the part foundries are playing in this great work which is being rushed to the limit. A large concern, employing at the present moment, however, only 16 molders was called upon to make and deliver two 300 ton hydraulic shell forging presses for drawing 18 pounder shrapnel shells. The total weight assembled was a little over 30 tons and there was to be no delay in shipment.

Nature of Equipment

The foundry was equipped with overhead travelling crane, 72 in. and 54 in. diameter cupolas and every modern convenience for general work but quite unsuited for heavy hydraulic castings. On account of a deficiency in the required equipment for flanks and molders it was only possible to make one at a time of the 17,000 lb. castings of which there were 2 required which left a total of 54,800 lbs. of iron to be melted for the other special castings of which there were 2 of 10,500 lbs. top tables 2 of 6,400 lbs. rams 26 in. diam,; 2 of 1100 lbs. rams 10½ in. diam.; 2 of 900 lbs. rams 8½ in. diam., but an addition there was the regular work which amounted to some 15 tons. This tonnage would take too long to melt in the small cupola, consequently the large one had to be used.

The 8½ ton table required three hours to feed and the 72 in. cupola melted 18-20 tons per hour which would make it necessary to have the molders put up enough work to total at least 125,000 lbs. which was done in 2½ days of 10 hours each. Not in itself such a bad performance when it is remembered that only 16 men were used.

Drying a Large Mold

The core ovens were 60 inches wide while the platen to be made was 92 inches in diameter, without the flask, consequently a dry sand mould could not be made. Fortunately we had a turntable flask the drag of which was about 12 inches deep and the cope 11 inches. A wooden ring was built up out of 3 in. pine segments and nailed together forming a drag 12 in. deep into which the turntable drag was set the two parts being rammed up as one. Two molders with air rammers and one helper rammed and then swept up the job finishing it and setting cores by means of a spider. The cope was rammed upon a board, nailed up and dried with the drag the following day by supporting it on trestles and building a fire underneath. Care was taken to see that the flames were kept low and the heat distributed as uniformly as possible.

While it was realised that such a weighty chunk as this should be made in a dry sand mold, our core ovens being so small necessitated skin drying, which was done by employing a mixture of 9-1 flour and sand wetted with clay wash. This was placed for a depth of 1½ inches on the outside of the mold and after blacking had been sprayed over and brushed with glutine which is a core binder composed of resinous compounds which are the by-product of the wood pulp industry, and a proportion of sour beer. The other cores and in particular the small tee ones were made of a mixture containing one part of oil to thirty parts sand. It was found that all other core mixtures were unsuited for this class of work as they were incapable of withstanding the heat without casting the cores to bake or fuse. With this mixture 45 minutes sufficed to clear the burned cores, rods, nails etc., from the slot. In setting the cores they were placed when just hard enough to handle as the subsequent skin drying which was done with steel plates and coke in about four hours gave off enough heat to dry the cores.

The pouring gates dropped iron straight down to plates nailed on the bottom of mold, so it was necessary to cut small gates in the webs of the cores to let iron in on both sides of the cores, which prevented the possibility of iron breaking core, due to the head of metal. Great care was exercised in making this skin dried mold to guard against the deep walls, cope, etc., from giving trouble due to lack of nails and gaggers which were used freely. In drying a slow uniform heat was used and a moderate temperature to prevent the flour burning out and causing the walls to crumble.

The 5 ton castings were straight dry sand work as were the 10½ in. and 8½ in. rams straight green sand, while the 26 in. rams were made with a ring pattern about 24 in. long; the mould being cheeked up and the pattern drawn as the work progressed. All cores were made with sweeps which effected a great saving in time, labor, and expense. The iron mixture used contained 30 per cent. of steel, and from the following figures it will be seen that the results were quite satisfactory.

	Sample No. 1	Sample No. 2
Silicon, per cent.	1.38	1.48
Manganese, per cent.	.55	.50
Sulphur, per cent.	.127	.142
Phosphorous, per cent.	.454	.415
Combined carbon, per cent.	.76	.70
Graphitic carbon, per cent.	2.19	2.85
Total carbon, per cent.	2.95	3.55
Chill depth, inches	¼	⅜
Tensile strength, pounds per square inch	32,850	32,700

Mixture of Iron

A 4 in. square test piece showed very uniform metal throughout, and a 1½ in. square piece showed that the iron could be easily machined, and showed no signs of excessive hardness.

Transverse test 1¼ in. dia. on 12 in. centres.

Maximum load, pounds, 4,000 defection, inches .18.

The heavier of the smaller castings required twenty-four hours to cool before cleaning, and the 8½ ton piece required 36 hours.

An Improvised Job

Recently an order for a hydraulic accumulator 23 feet long and 13 inches diameter was received. The thickness of casting was 5 in. and a 4 in. diam. core ran down the centre for almost the whole length. There was no pit, no flanks and no core ovens for drying which would fit the work; so it was necessary to improvise as much as possible.

A red pine flask was made out of 3 in. stock leaving approximately 14 in. sand around the pattern. Some iron bars were found which would fit and four were placed in the cope and four in the drag. The cope and drag were both 24 inches deep, which would make the approximate weight of cope some 9 or 10 tons which is quite a weight for a wooden flask and the figure given does not include the weight of the timber but sand only. Iron hooks for lifting with the crane were made from 3½ in. x 1 in. steel plates forged to shape at one end.

The pouring gates were 1½ in. and the runners to castings were 2 in. x 3 in.

high (they being made high so that iron would not be carried out against and cut the core) on each side 15 in. from each end of casting. The risers were 4 in. x 3 in. and $6\frac{1}{2}$ in. diam. and as there were four they were evenly spaced from the highest point at the big end where the largest was placed.

The mold was rammed by three molders, two with air rammers, assisted by two helpers the pattern was drawn, the whole job nailed and blackened in 10 hours. This was a dry sand job the mixture being 1 barrow old molding sand; 2 barrow new moulding sand; 1 barrow old river moulding sand; 1 barrow new river moulding sand; 2 pails saw dust; $\frac{1}{4}$ bag sea coal. Wet with thick clay wash. Plates, set on bricks on the parting line of drag, supported wood and coke which dried the mold in six hours.

Construction of Core

The core was anchored with 4 $1\frac{1}{2}$ in. diameter chaplets and $4\frac{3}{4}$ in. chaplets put down through the cope and barred. The heads of all chaplets were shaped to the diameter of core to prevent or minimize chances of slipping. The diameter of the $1\frac{1}{2}$ in. chaplets while unnecessary to hold core, was increased to minimize chances of burning. These chaplets were set one yard apart or very nearly so, as this was deemed advisable on account of the very small diameter of the core, the core's great length which necessitated a fairly large vent hole thus weakening and allowing it to spring in spite of $6\frac{3}{4}$ in. diameter and four $\frac{1}{2}$ in. core rods; also the thickness of the metal.

As the mold was poured in a horizontal position from each end and had to be run cold so as not to strain the mold or burn the core (which was protected by being inserted in a pipe) a small ridge was made along the top of casting to receive any or all dirt which might accumulate. This ridge was afterwards planed off before turning. The core was made in two sections and jointed with a pipe in the vent hole. Oil sand was used in the mixture, as in cases similar to the above, it had proved its capability of withstanding the extreme heat and pressure.

It might be said that in 10 days from the time the order was placed the castings were delivered. In addition to the heavy presses which are being made there are all kinds of dies, tool holders, gauges, chilled dies and machine repairs so that I believe the foundryman as usual deserves some little credit.

WAR EXPENDITURE BY THE DOMINION

A STATEMENT of Canada's war expenditure, with the establishment, strength, organization, and distribution of the expeditionary force, has been printed for presentation to Parliament. It is a formidable memorandum of one hundred pages.

Up to March 18, according to the memorandum, 262,999 officers and men had been reckoned as having joined the expeditionary force, besides 13,000 on garrison duty in Canada, bringing the total up to 275,000. As the authorized total is now 500,000 there remains a balance of 225,000 to be raised.

The forces are divided as follows:—

Overseas, elsewhere than in England, 62,000.

Overseas, in or on passage to England, 44,000.

In Canada, 134,000.

Total effectives, 240,000.

Non-effectives (casualties, etc.). 22,000.

Total expeditionary force 262,000.

Total on garrison duty, etc., in Canada, 13,000.

Grand total, 275,000.

Required to complete total authorized, 225,000.

The expeditionary force consists of, or will presently consist of, an army corps of three divisions; a fourth division (not yet formed); a brigade of cavalry; line of communication units; units allotted to oversea garrisons, and troops in England and Canada and elsewhere than in France. Three Canadian general hospitals and three stationary hospitals are serving in the British Mediterranean expeditionary force and the 38th Canadian battalion (Ottawa) is at Bermuda, and a company of the Royal Canadian Garrison Artillery is at St. Lucia, British West Indies.

Canada's war outlays to the end of the last calendar year totalled $152,996,048.95, of which $99,819,435.40 was spent within nine months of the present fiscal year. The principal items of expenditure were $81,873,230 for pay and allowances, $7,263,099 for ocean and $3,289,589 for land transport $9,148,607 for separation allowances, $9,911,707 for clothing $4,361,509 for boots, $4,909,660 for remounts $3,423,488 to the Ross Rifle Company, $2,066,263 to the Dominion Cartridge Company, and $2,880,683 for motors conveyances.

Details of the 25,500 contracts covered by these expenditures are not given in the memorandum, but it appears from copies of orders-in- Council that special steps were taken a year ago to equip the Canadian forces for a lengthening war.

On February 3, last year, an order for twenty thousand rifles and bayonets was placed with the Ross Rifle Co. at $28 for the rifles and $5.25 for the bayonets. A further order for sixty thousand was placed on Feb. 20, deliveries to be made at the rate of ten thousand monthly. All these rifles were to be of the mark 3 pattern, the prices in the second order being the same as in the first. A memorandum from the chief of the general staff. General Gwatkin, estimated the needs in a year's time with 150,000 men enlisted at 140,000 rifles and 175 million rounds of ammunition. Assuming that the war would last longer he advised the ordering for delivery during the year of 120,000 rifles and two hundred million rounds of ammunition. On May 14, last year, authority was given for the purchase of another sixty thousand rifles of the same pattern and at the same price, on the recommendation of the same officer.

NEW EXPANDED STEEL TRUSS SECTION

THE application of the expanded metal principle to the production of trusses has been successfully accomplished by the Bates Expanded Steel Truss Co., who have published the results of tests made at the laboratory of the Illinois Steel Company.

The new truss which can be employed as a beam or column, is made from a specially rolled steel H-section, which is sheared through the web in a series of cuts close to the flange, the cuts at one flange being staggered in relation to those at the other flange. The beam is then heated and placed on an expanding machine which pulls the flanges apart causing the slotted section of the web to expand or open out into the familiar triangular spaces. Tapered trusses suitable for use as posts, columns, masts, etc., are made by expanding one end only. A load of 400 pounds without deflection, failing at 600 pounds was the original strength of an H-section tested, which, when expanded sustained a load of 1,600 pounds without deflection and failed under 3,250 lbs.

Arc Welding.—Arc welding has been experimentally used for depositing new metal on worn flanges of steel car wheels. The electrode employed was of $\frac{1}{4}$ in. diameter cold-rolled steel. The total cost of removing, welding, finishing and replacing a wheel amounted to $3.50, which is approximately the same as that of turning down, while the value of the metal that would be wasted in turning is saved. Moreover, if turned, at least $\frac{5}{8}$ in. of metal would have to be removed from the thread, reducing the life of the wheel by one-third. Wheels with welded flanges have run on an average 40,000 miles, which might be increased by using carbon electrodes and chilling the metal. The process has also been employed for restoring flat spots on wheels by depositing new metal and grinding to a true contour.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

FOUR-TOOL CARRIAGE FOR SHELL LATHES

THE photographs reproduced herewith illustrate a special lathe attachment supplied to the order of a large French shell manufacturer by the Jersey City Machine Company, 40 Cedar Street, New York City. The apparatus as illustrated is designed for machining the outside of 9-in. shell blanks, and is adapted for use on the standard Niles- Bement-Pond 36 in. triple geared lathe. Figs. 1 and 2 illustrate the carriage. Fig. 3 illustrates the driving arbor, and Fig. 5 shows the rough, intermediate and finished sizes of the shell.

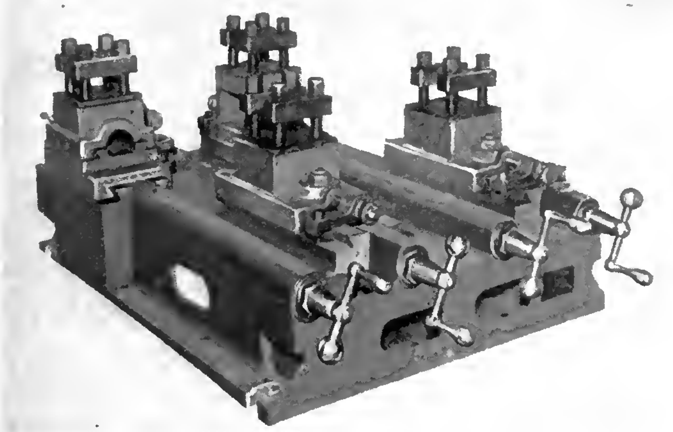


FIG. 1. OPERATING SIDE OF FOUR-POST TOOL HOLDER FOR SHELL LATHE.

Fig. 1 shows the operating side of the carriage, all of the rests being adjustable from the front, while the feed screws for Nos. 1 and 3 back cutting rests are carried through to the back, as shown in Fig. 2, for convenience in operation. With the exception of No. 1 rest, which is arranged for cutting a special taper at the mouth of the shell, all of the rests are provided with limiting stops for controlling the minimum diameter of the shell. These are in the shape of bar-clamps, which are secured to the vee-slides, and through which pass the adjusting screws carried by the rests.

An increasing thickness of wall is formed in the forging near the mouth of the shell. The object of this is to provide suitable metal so that, when nosed-in, the shell will be of proper thickness. The vertical shaft on the back of carriage, Fig. 2, carries a lever on either end, the upper lever which is half the length of the lower lever, being connected by a rod to No. 1 rest. The lower lever engages with a suitably-shaped groove carried on a bracket similar to the ordinary taper-turning attachments on lathes. As the carriage travels along the ways, the roller on the lower lever is moved towards the carriage, causing the upper lever to draw No. 1 rest away from the work during the required distance of travel, thus imparting the necessary form to the shell. Independent adjustment is provided by the small double-ended swape shown in this view.

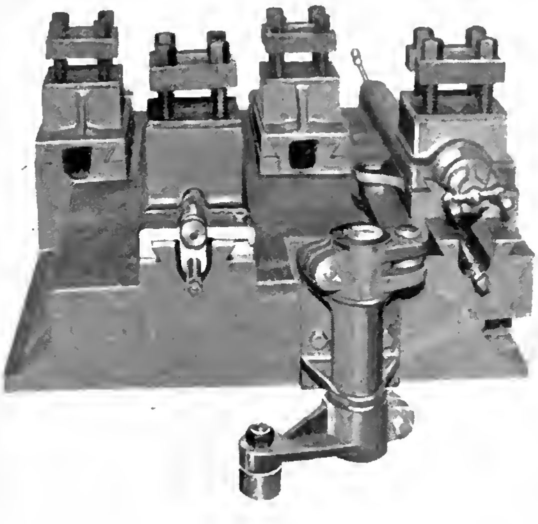


FIG. 2. REAR VIEW OF FOUR-POST TOOL HOLDER SHOWING TAPER FORMING ARRANGEMENT.

The driving arbor shown in Fig. 3 is of the automatic expanding type, and consists of a flanged stem, a slotted sleeve, and three dogs, with the necessary retaining plate, screws, etc. The stem is formed with three eccentric diameters resembling flutings on a left-hand reamer, and when assembled with the sleeve, etc., as in the lower part of the illustration, a backward motion of the sleeve on the stationary stem causes the dogs to slide up the inclined faces of the grooves, thus expanding them against the shell. The driving power increases as the sleeve is forced round, so that the heavier the cut, the firmer the grip.

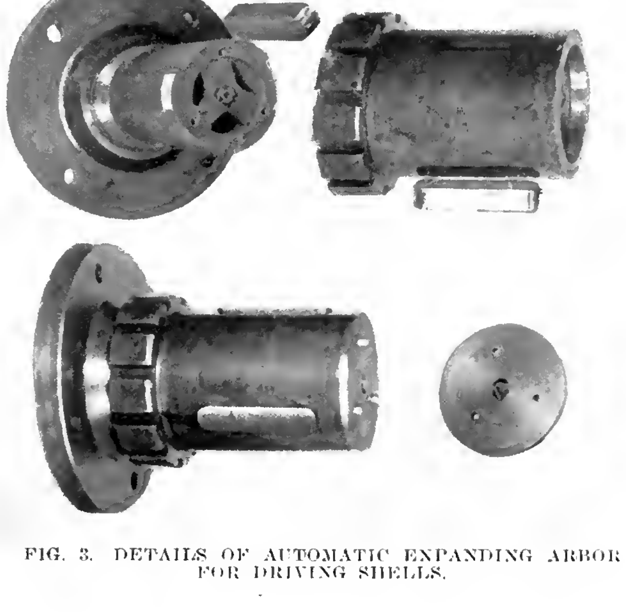


FIG. 3. DETAILS OF AUTOMATIC EXPANDING ARBOR FOR DRIVING SHELLS.

Still Less Tonnage.—When the estimates of the Department of Trade and Commerce were taken up in the House of Commons at Ottawa recently Sir George Foster frankly stated that during the coming season there was likely to be a considerably greater shortage of ocean tonnage than last year. It probably would be necessary, he said, to do many things we do not want to do and present avenues of trade may be interrupted.

ONTARIO WORKMEN'S COMPENSATION ACT

THE results of the first years operation of The Workmen's Compensation Act in Ontario, as shown in the report for 1915, tabled in the House on April 14, are satisfactory beyond all expectations and indicate the far-reaching benefits that accrue to the workmen under this legislation. One of the surprising features of the report is the fact that out of 17,033 notices of accidents that have been received up to December 31st, only 1,117 remained unadjudicated at the close of the year, and these were only awaiting the necessary reports from the workmen and the employers. Under the old Act where the workman had to sue and prove negligence, it is probable that only a small proportion of these accidents would have been dealt with and a good proportion of the judgments if in favor of the workmen, would have gone to appeal. Under the present Act, the relations between the two classes and the board, and between each other have become growingly friendly as the benefits of the Act have been revealed. The assessments for 1915 have proved more than were required in all except one of the classes, and the board state that substantial reductions in the present year and in some cases these reductions will be retroactive and apply to 1915.

Assessments Collected

The figures show that the assessments collected during 1915 amounted to $1,539,492.40, of which $1,186,221.62 was distributed or will be for accidents, and that a net balance or surplus remains of $395,026.40, a large portion of which will be remitted to the employers in lessened rates during the present year. The total number of accidents for which compensation was made 9,829. Of these cases there were 8,544 cases of temporary disability, 1,034 of permanent, and 251 deaths. The largest number of accidents occurred from falling, rolling, and flying objects, namely, 2,587; the next from machinery and parts, 2,098; third, from falls, 1,100; fourth, dangerous substances, such as electric currents, 623; moving vehicles, 270; hoisting apparatus, 208; runaways and animals, 78. Out of these, 773 cases developed blood-poisoning, of which four caused death and 11 amputation.

There were 170,711 days lost, equivalent to 569 men's labor for one year.

The amount paid by the board for injuries and disablements required on an average 150 cheques daily, amounting to $3,600.

The board in its report as to the working of the Act says: "The Act has worked smoothly and satisfactorily. The benefits of the new system of law to both workmen and employers are recognized and appreciated. Claims are expeditiously and inexpensively disposed of. Employers are immune from the expense and annoyance of litigation. The intricacies and hardships upon workmen and their families of the old doctrines of negligence, common employment and assumed risk are eliminated. The facts to be determined by the board are usually few and simple. There is no longer need for payment of legal fees either by workmen or employers."

There were 14,750 employers in Schedule 1 contributing to the Accident Fund, but not individually liable. For Schedule 2 there were 1,252 employers liable for payment of compensation fixed by the board, but not contributing to the Accident Fund. These included such bodies as railways and municipalities. There were also Crown cases, including the Timiskaming and Northern Ontario Railway and the Hydro-Electric Power Commission, who voluntarily placed themselves under the operation of the board.

The figures show that the average wage of those injured was $13.27 a week, the average age being 33 years, running between 81 years, the oldest, and 11, the youngest.

Working of Act Informal

The working of the Act is quite informal, the employer being compelled to send in a notice within three days after the accident, and forms are sent to the workman and surgeon as well. In many cases the claims are subjected to personal investigation by an officer of the board, and evidence is taken on oath.

The largest number of cases reported were from York County, 1,868; Wentworth County, in which Hamilton is located, was second, with 919; Algoma, in which the big salt works are located, was third, with 473; while Sudbury, with the copper mines, was fourth, with 468.

No payments are made except where the injury disables a man for at least seven days. This will account, of course, for the number of cases reported where no compensation could be awarded under the Act, as some were very trivial, including a mere scratch. There were 2,385 cases of one to two week's disablement, 1,625 two or three weeks; 964 three to four weeks; 585 four to five, while there was one case in which the disability extended for 41 weeks.

The general attitude of employers toward the Act is indicated by the request of a large number who are not liable under the present provisions for assessment or payment of compensation, who have expressed the wish that they should come in under the terms of the Act. In conformity with this desire legislation is now before the House.

Naturally, in an Act that increases the percentage of cases where compensation is granted for injury, the number of widows and children and other dependents benefited is one of the gratifying features. The tables show 65 widows as beneficiaries, 116 children, and of those totally or partially dependent, 35 mothers, 18 fathers and 10 others.

RAILWAY DEVELOPMENT IN CANADA

THE operating mileage of Canadian railways during the statistical year ended June 30 last, increased by 4,787 miles, although eleven months of the year were included in the war period. The mileage now stands at 35,582.

The statistical report of the Department of Railways, prepared by John Lambert Payne, Comptroller, was tabled in the House of Commons recently by Hon. J. D. Reid, Acting Minister. It shows mileage increases in all provinces except Prince Edward Island, the heaviest increase being 1,500 miles in Ontario, where the mileage is now 10,703. Approximately 1,600 miles were under construction, apart from surveys and projections, when the year ended. Including double tracks, yard tracks, sidings, etc., the total of all tracks in Canada comes to 45,885.

Railway capitalization increased by $66,990,127, bringing the total up to $1,875,810,088, including, stocks, $847,801,101; consolidated debenture stock (C.P.R.) $176,284,882; bonds, $851,724,905. There are also outstanding against lines under construction, stocks amounting to $29,257,500 and bonds of $52,224,004. Stock dividends in 1915 were $32,341,337, an increase of nineteen millions.

Lines owned and operated by the Government, and which are not capitalized, are covered in the report under a statement of cost amounting to $293,542,201.

Cash subsidies given during the year amounted to $5,059,284, of which the Dominion contributed $4,644,664, bringing the total up to $238,831,924. Total authorized guarantees by the Dominion amounted to $188,965,063 and from all sources to $409,869,165.

There was a decrease of 380,245 in the number of passengers and 14,189,151 in the tons of freight carried. The average haul was 212 miles, which is the longest in any country. Mine products led in the various classes of freight, with agricultural products second.

Gross earnings fell from $243,083,539 to $199,843,072, a decline of 17.8 per cent. due to the dividend conditions created by the war and following a sustained upward movement in traffic and revenue.

Operating expenses also decreased by $31,244,159. The number of employees was reduced by 35,000 while, though there was no reduction in the average rates of remuneration, the total salaries and wages bill declined from $111,762,972 to $90,215,727.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager
PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.
PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.
H. C. FOGARTY.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. APRIL 20, 1916 No. 16

INDUSTRIAL RESEARCH AND THE OPEN MIND

THE question of scientific and industrial research is engaging the attention of many manufacturers in this country, who, until the matter was forcibly impressed upon them by the commercial upheaval since hostilities started, did not appraise at its full value the wonderful development of technical education by our enemy.

It is more than desirable, indeed—it is imperative that our manufacturers strengthen their impending entry into world-wide markets by availing themselves of all possible sources of information, means of research, and methods of organization. The sources of information available to us will more than likely be available to our competitors, but no matter how much exclusive information any of our manufacturers might be able to obtain, it would be but of negative value if not vigorously applied to active production and progressive advancement.

Let these words imprint themselves on the minds of those who look forward to the day when the industrial resources of this country find themselves competing on level terms with reorganized Europe for a share in the world's trade. "It appears incontrovertible that if we "are to advance or even maintain our industrial position "we must, as a nation, aim at such a development of "scientific and industrial research as will place us in a "position to expand and strengthen our industries, and to "compete successfully with the most highly organized of "our rivals." Not to-day or yesterday, but almost a year ago the foregoing sentence appeared in a British Order in Council, setting up an Advisory Council for the Organization and Development of Scientific and Industrial Research. Since then industrial history has been made in Britain, and results have been obtained which should stimulate all of our manufacturers to further and sustained effort for their common welfare.

One feature of the activity referred to calls for special reference, and that is the pooling by manufacturers in certain industries of their knowledge and experience for the common good. The time is not yet ripe for entering into detail regarding the results obtained by the Council, but two instances may be mentioned which indicate the extent of their accomplishments for the benefit of British industry. Silk manufacturers have been persuaded to sink their scruples and co-operate for the purpose of achieving important results, and a similar end has been achieved in connection with pottery manufacturers, who have decided to build an Institute of Research for the common good of the whole industry.

Occurrences such as these in two of the most conservative industries should disarm instantly those critics who would question the advisability of proceedings of a like nature in this country.

Life is too short, and our duty to each other too imperative to allow selfish motives to retard the wheel of national progress at this late hour of the day. The value lies not so much in the knowledge as in the application, and many objectors to the policy of the open mind could probably be refuted by instances in their own factories where equal opportunities for obtaining experience, information and advancement have been followed by widely varying results. As with the individual, so with the group,—given equal facilities and interchange of knowledge, the ultimate advantage will be with those who apply results to get still more results, and in getting these last results they will find themselves still further ahead of those who receive only, and receiving do not give.

A most encouraging event to the advocates of industrial research was the recent meeting of shell manufacturers in Toronto, which was for the purpose of considering ways and means for effecting various economies through the interchange of experience, standardization of methods and tools, etc. Such action will be more freely acquiesced in under present circumstances, and the benefits to be derived will most certainly be an inducement to extend such efforts in the future, if not to the industry as a whole, then at least to certain desirable sections of it.

ECONOMY IN USING METALS

THE present state of the metal market, while gladdening the hearts and fattening the purses of metal producers, ought ultimately to have a beneficial effect on the manner of consumption by large users in particular and individuals in general. In too many cases we have been apt to use whatever was most easily available and gave no thought to other materials which would have served the purpose equally as well. Much of this practice had become more habit than anything else, and only the hard fact of actual scarcity has been able to persuade people that something cheaper would be just as satisfactory.

The successive changes from brass to cast iron, and cast iron to wood in the matter of shell shipping plugs is an outstanding instance of such necessity. The results are quite as satisfactory, and any manufacturer who in his private business could effect such a saving would not be likely to return to the use of the more expensive metal, even when prices are normal.

Most people never know what they can do without till they are forced to, and not the least of the ultimate benefits of the war will be in the general economy of material, which will be practised as a result of the many more or less compulsory experiments which are being carried on at the present moment.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 70	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	
	Montreal	**Toronto**
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Victoria, No. 1	$27 00	$25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.75
Steel bars, f.o.b.. Toronto	3.00
Steel bars, 2 in. and larger, base	4.00
Common bar iron, f.o.b.. Montreal	2.50
Steel bars, f.o.b., Montreal	3.00
Twisted reinforcing bars	2.80
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	3.00
Small shapes	3.25
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	3.10
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$33 00	$30 50
Electrolytic copper	32 50	30 50
Castings, copper	31 00	30 00
Tin	51 00	58 00
Spelter	23 00	23 00
Lead	10 00	11 00
Antimony	48 00	48 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in.	$3 75	$4 00
Heads	4 00	4 25
Tank plates, 3-16 in.	4 05	4 50

WROUGHT IRON PIPE

Prices in effect April 3, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 00	5 31
1/2 in.	3 83	5 91
3/4 in.	4 60	7 42
1 in.	6 80	10 97
1 1/4 in.	9 20	14 84
1 1/2 in.	11 00	17 74
2 in.	14 80	23 87
2 1/2 in.	23 40	37 73
3 in.	30 60	49 34
3 1/2 in.	36 80	59 34
4 in.	43 60	70 31

Lapweld

2 in.	16 28	25 35
2 1/2 in.	23 99	38 32
3 in.	31 37	50 11
3 1/2 in.	37 72	60 26
4 in.	44 69	71 40
4 1/2 in.	54 61	87 00
5 in.	63 64	101 40
6 in.	82 56	131 50
7 in.	114 20	174 90
8 in. x 25 lbs. per ft.	120 00	183 80
8 in. x 25 lbs. per ft.	138 20	211 70
9 in.	165 60	253 60
10 in. x 32 lbs. per ft.	153 60	235 20
10 in. x 40 lbs. per ft.	197 80	302 80

Ontario list—All points from Kingston and west to, but not including Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	2 94	5 25
1/2 in.	3 74	5 82
3/4 in.	4 49	7 30
1 in.	6 63	10 80
1 1/4 in.	8 97	14 61
1 1/2 in.	10 73	17 46
2 in.	14 43	23 50
2 1/2 in.	22 82	37 15
3 in.	29 84	48 58
3 1/2 in.	35 88	58 42
4 in.	42 51	69 22

Lapweld

2 in.	15 91	24 98
2 1/2 in.	23 40	37 73
3 in.	30 60	49 34
3 1/2 in.	36 80	59 34
4 in.	43 60	70 31
4 1/2 in.	53 34	85 73
5 in.	62 16	99 90
6 in.	80 64	129 60
7 in.	111 90	172 60
8 in. x 25 lbs. per ft.	117 50	181 30
8 in. x 28 lbs. per ft.	135 40	208 80
9 in.	162 20	250 10
10 in x 32 lbs. per ft.	150 40	232 00
10 in. x 40 lbs. per ft.	193 60	298 70

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 25	$18 00
Copper, crucible	21 75	21 00
Copper, heavy	22 00	20 75
Copper wire	22 00	20 75
No. 1 machine compos'n.	17 00	16 50
No. 1 compos'n turnings.	15 00	14 50
New brass clippings	16 25	14 50
No. 1 brass turnings	12 00	11 50
Heavy melting steel	9 00	9 30
Boiler plate	11 75	14 00
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	10 50	9 00
Stove plate	10 50	9 50
No. 1 machin'y cast iron	14 75	14 00
Heavy lead	7 25	7 25
Tea lead	6 25	6 25
Scrap zinc	15 25	15 75
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	55
Stove bolts	65
Plate washers	30
Machine bolts, 3/8 and less	47 1/2
Machine bolts, 7-16 and over	37 1/2
Blank bolts	37 1/2
Bolt ends	37 1/2
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in. $3.75 per lb. off	
Nuts hex., over 1 in. $2.00 per lb. off	
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	42 1/2
Boiler rivets, base, 3/4-in. and larger	$4.35
Structural rivets, as above	4.10
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS.

	Per cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	60
Finished nuts over 1 in.	55
Semi-Fin. Nuts up to 1 in.	60
Semi-Fin. Nuts over 1 in.	55
Studs	45

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	67 50
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES.

Standard steel wire nails, base	3 45	3 65
Cut nails	3 20	3 20
Miscellaneous wire nails	65 & 15 p.c.	
Pressed spikes, 5/8 diam., 100 lbs.	$3 75	

MISCELLANEOUS

Solder, guaranteed	0.31½
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.77
Linseed oil, raw, single bbls.	1.00
Linseed oil, boiled, single bbls.	1.03
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Lead wool, per lb.	0.13
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	50
Standard drills over 1½ in.	15
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	10
Bit stock	50
Ratchet drills	15
Machine bits for wood	10
S.S. drills for wood	20
Wood boring brace drills	35 and 5
Electricians	20
Sockets	50
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks	list plus 5
Bridge reamers	55
Centre reamers	5
Chucking reamers	5
Hand reamers	5

High speed drills and reamer prices withdrawn.

COLD ROLLED SHAFTING

At mill	list plus 20%
At warehouse	list plus 30%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 5 per cent.; B and C, 25 per cent.; cast iron, 50 and 10; standard bushings, 60 per cent; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$4 00
Sheets, black, No. 10	4 35	4 50
Canada plates, dull, 52 sheets	4 00	4 25
Canada Plates, all bright	6 30	6 00
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	6 75	6 75
Premier, No. 28, U.S.	7 25	7 00
Premier, 10¾ ozfl.	7 50	7 25

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.35
⅜ in.	6.90
7-16 in.	6.75
½ in.	6 55
9-16 in.	6.55
⅝ in.	6.35
¾ in.	6.15
⅞ in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B B

⅛ in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16 in.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	65-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	....
1¼ in.	19 55	....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	12 50
2¼ in.	26 60	13 30
2½ in.	29 00	15 95
3 in.	38 70	17 50
3¼ in.	42 00	21 00
3½ in.	44 00	23 00
4 in.	49 50	28 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble,	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.15¼
Peerless	.15¼
Grand	.14¼
Superior	.14¼
X L C R	.13¼
Atlas	.13¼
X Empire	.12¼
Ideal	.12¼
X press	.11¼
COLORED.	
Lion	.09½
Standard	.08¾
No. 1	.08¾
Popular	.07¾
Keen	.06¾

WOOL PACKING.

Arrow, Axle, Anvil, Anchor ..... Prices on application

WASHED WIPERS.

Select White, Mixed colored, Dark Colored ..... Prices on application

This list subject to trade discount for quantity.

COPPER SHEETS

	Montreal	Toronto
Bars. ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 m.	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.35 to .37
Tin	.60 to .64
Zinc	.25 to .27

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American.	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy	.35
Copper sulphate	.30
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., April 17, 1916.—Industrial and commercial activity in all lines of industry is reflected in the many very prosperous reports recently issued by some of the large manufacturing interests throughout Canada. It is interesting, and also encouraging, to note that, in addition to the volume of business now being done in the manufacture of munitions, there is a steady increase in the domestic production of this country. The possibilities of shipbuilding in the Dominion are now under consideration, and in all probability the present year may develop into one of considerable activity in this line.

Pig Iron

Little change is apparent in the pig iron situation, the demand for steel making purposes being still very great. With the furnaces working to capacity and orders booked far in advance, all prices on pig must be considered as nominal.

Steel

Reports continue to come in, which indicates the satisfactory condition and prosperity prevailing in all branches of steel industries. No general advance is recorded in steel prices, but certain lines show slight increases. Iron bars, with advance of ½c, are now $2.40 Chicago. A slight advance of 10c a hundred is noted on New York and Philadelphia prices. Steel hoops, Pittsburg, at $3.25, show an advance of ¼c per pound. Prices at present are firm on sheets. Dealers here are active in all lines, but report no change in local quotations.

Metals

The feature of the week's market has been the extraordinary activity in copper, which continues to rise. Tin is comparatively strong, but owing to shipping conditions the situation is one of uncertainty. Spelter is not very active, but prices have increased, following the lead of copper. Lead is easier and quiet.

Copper.—The heavy purchases recently made by foreign Governments for copper supplies has resulted in a very strong market. New York is now asking the nominal prices of 29½ cents for lake, 30 cents for electrolytic, and 27¾ cents for castings. This is an advance of 1½, 2 and 1¼ cents respectively. Local conditions are moderately active, and prices here are higher. Lake, with an advance of 2 cents, is quoted at 33 cents; electrolytic up 1½, is quoted at 32½ cents, and castings are higher by 1 cent per pound, present price being 31 cents.

Tin.—With the unsteady situation prevailing in the tin market, it is difficult to define the present or early future conditions. The London market reports a drawing together of spot and future prices, the quotation of standard spot having declined £2 15s., the present price being £199 5s. On the other hand, futures have become stronger, and an advance of £2 5s. has brought the price up to £198 5s. London reports a lower price on Straits tin; with a decline of £2 15s., the present quotation is £199 5s. New York is asking the nominal figure of 53¾ cents, an advance on the week of ¼ cent per pound. Dealers here report fair business, with prices unchanged at 51 cents a pound.

Spelter.—The present condition of the spelter situation is one of comparative quiet, with prices firm, showing signs of advancing. The present strength of spelter is largely due to the recent advance in copper. London reports a very strong market, with an advance of £6 on spot and futures, quotations being £100 and £90 respectively. The New York market shows an advance of ⅝c per pound, with the nominal figure of 19.42 being asked. Local prices are unchanged at 23, with a fairly active market.

Lead.—Many foreign inquiries have been made for lead, but no record of sales has yet been made. Prices here are unchanged at 10 cents, and dealers report fair business.

Antimony.—A decline of 2 cents is reported from New York on far Eastern and American brands. Local conditions are, however, unchanged, and prices are firm at 48 cents per pound.

Aluminum.—The situation shows little change, with prices firm at 68 cents per pound.

Machine Tools and Supplies

It is encouraging to note that with the falling off in demand for shell machinery the inquiries are gradually increasing for domestic requirements, and with the advent of many new industries in this country, it is expected that the activity in the machine tool industry will continue for some time to come. The demand for small tools and general supplies continues, and to meet the constant increase in cost of production and raw materials, prices continue upward.

Old Materials

The scrap situation has been relatively affected by the recent advances in copper and spelter, prices being higher and the demand good. Old copper and brass show an average advance of 1/4c on most grades. The price on scrap zinc is now 15 1/4c, which is an advance of 1/4c. Dealers report good business in heavy melting steel, scrap and other lines of old iron and steel.

Toronto, Ont., April 18.—Industrial conditions continue to show steady improvement and the outlook generally is more favorable. With the development of trade there is more optimistic feeling in business circles and increased confidence in the future. Business is on a more stable basis as speculation has been more or less eliminated. Enterprises are being conducted on more cautious lines rendered necessary by the conditions prevailing on account of the war. The possibilities of developing the export trade of the country are now more generally realized and efforts are being made by manufacturers to establish connections in the foreign markets where Germany previous to the outbreak of the war did a considerable part of the business. If this campaign is as successful as anticipated it will help towards maintaining a favorable balance of trade after the war.

The inland freight situation is still acute although some relief is looked for as soon as navigation on the lakes is in full swing. The congestion at the terminals is delaying shipments and causing dealers and manufacturers considerable inconvenience. The ocean freight situation is no better and indications point to the shortage of tonnage becoming more acute and freight rates higher.

Steel Market

An indication of the enormous demand for steel in Great Britain is furnished by the prohibition which the British Government has recently placed on the exportation to any destination of pig iron and nearly all kinds of steel. The prohibition applies principally to rails, springs, tubes, axles, structural steel, ingots, bars and plates. Although very few of these products are made in Canada, it will probably mean that there will be a bigger demand for other materials, such as the Canadian steel companies are able to produce. The Dominion Steel Corporation is shipping large quantities of billets, wire nails, wire rods and barb wire to England and the Steel Company of Canada is also doing a big export business at very profitable prices. This export business has developed into an important feature. It has however affected the domestic market by tending to raise prices and is contributory to the present scarcity of steel. The mills are endeavoring to take care of their domestic trade, apart from munitions, but the export demand is so insistent that they have considerable difficulty in meeting the home demand.

Prices continue to advance and the market is very strong. Prices of lap-welded boiler tubes have advanced for some sizes but seamless are unchanged in the meantime. Makers report that the new demand for locomotive and boiler tubes still very heavy, being sold up for three of four months. Boiler plates have advanced and are now quoted as follows: plates 1/4 to 1/2-in. $4; heads, $4.25 and tank plates 3-16-in., $4.50. In the new quotations there is a change in the differential between the heavier and lighter plates due to the mills only rolling desirable tonnages and the heavier plates get the preference. Some mills are not taking orders for light plates.

The general situation in the sheet market is becoming stronger and the usual price of differentials between the different gauges have practically disappeared. The heaviest demand is for blue annealed sheets and some mills have their output sold up for the remainder of the year. The situation for galvanized sheets is practically unchanged but the increase in cost of spelter is tending to restrict the output of galvanized sheets.

The United States Steel Corporation has advanced the price of Bessemer and open hearth steel rails from $28 to $33 per ton effective after May 1. This is an important event in the steel trade as rails have been quoted at $28 for nearly fifteen years. The situation is generally unchanged, the demands on the mills for deliveries being as urgent as ever although new buying is lighter than for some months. The market is firm and steady there being no price changes of importance to note.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Pig Iron

The prohibition covering the export of pig iron proclaimed by the British Government will not affect this market to any extent as there has been no pig iron to speak of imported from Great Britain for many months. The situation is unchanged with quotations at the same level as last week.

Old Materials

The market is firm with few price changes of importance to note. The general trend of prices is upward particularly for coper and lead scrap. There is a good demand for copper scrap and heavy melting steel, other lines being only fairly active.

Machine Tools

There is nothing of particular importance to note with regard to machine tools. There is a fair and steady demand for tools for munition plants otherwise business is quiet. Deliveries do not show much, if any improvement, and prices have still an upward tendency due to increase in costs of raw materials and labour.

Supplies

The demand for machine shop supplies continues active and prices very firm. The only price changes of importance to note this week are in linseed oil and turpentine. The oil market is firmer and prices advanced 3c making raw oil $1 and boiled $1.03 per gallon. Turpentine declined 3c and is now quoted at 77c per gallon.

Metal Markets

The metal markets generally have reflected during the week an exceedingly strong tone, especially copper on account of heavy contracts recently placed in the States by British Government. Owing to very large tonnage involved it is more than likely that copper market will maintain considerable strength for many months. The tin market at New York is still being affected by the difficulty which is being experienced in obtaining permits to export metal from England. The spelter market while not active continues to reflect a rising tendency and a better demand Lead is quiet, with the outside market a little easier but the Trust price is unchanged. Both antimony and aluminum are unchanged and quiet. Solders are very firm but unchanged.

Copper.—The market is very strong following the large purchases recently made by the British Government. There has also been some very heavy buying in New York by domestic consumers which has also tended to strengthen the market. The copper market has never been in such a position as at present. The producers have never sold so far ahead as they are selling to-day and the demand is still pressing. Although the production of copper is materially larger than ever

copper is materially larger than ever before, the combined war and industrial demand is so strong that all the producers have been sold their output all the way from five to seven months in advance. The local market is unchanged and nominal at 30½c per pound.

Tin—The market is dull but firm. The difficulty that is being experienced in getting permits to export tin from England in quantities desired is still affecting the spot market and is tending to restrict business. Local quotations are unchanged and nominal at 58c per pound.

Spelter.—The market is quiet but has a good firm undertone. The demand especially for spot metal is improving and prices have an upward tendency. The strong copper market is influencing spelter owing to the connection between the two metals in the brass trade. Spelter is unchanged at 23c per pound.

Lead.—The "Trust" is holding the price of lead at 7.50c New York but the outside market is irregular and weaker. Producers are said to be well booked ahead which will tend to support the market. Lead is unchanged at 11c per pound.

Antimony.—The market is very dull and lacking in interest. Quotations are unchanged and nominal at 48c per pound.

Aluminum.—There is no change and the market is featureless. Aluminum is quoted at 68c per pound.

MAY BE COPPER SHORTAGE

THE purchase of 400,000,000 pounds of copper by England, together with enormous tonnages taken by domestic consumers threatens to bring about a shortage of copper for the balance of the year. Already the market is bare of June metal, several of the largest producers in the country not having a pound of this delivery available for sale, and the supply of July metal is fast approaching the same point.

The unprecedented demand from domestic consumers is unabated, the demand for August-September being particularly insistent. These months are selling at 27¾ cents, with an advance to 28 cents likely to be made at any moment. July is selling at 28 cents, but it is expected that it will soon command a premium because of the scarcity. All deliveries from September to December, inclusive, are now 27¾ cents a pound.

These record prices are not deterring consumers who are intent on covering their requirements for the balance of the year, bidding for large blocks to be delivered at the rate of one or two million pounds monthly. The 400,000,000 pounds sold to England, while constituting a new record for what is practically a single transaction, is probably far short of the aggregate tonnage taken by users of the metal in this country within the past few weeks.

The buying is lapping well over into 1917, although the larger producers are not inclined to contract heavily beyond December.

INCREASED SHIPPING FACILITIES NEEDED

NEARLY 104,000,000 bushels of Canadian grain, excluding flax, was shipped by water to United States lake ports during the fall navigation season of 1915, including 93,346,404 bushels of wheat; 3,646,644 bushels of oats and 1,836,263 bushels of barley, according to an article by R. M. Wolvin, of Winnipeg, in the recent number of the By-Water Magazine. We paid some $11,388,036 to United States railroad and shipping concerns for the privilege of delivering our grain through those channels, and according to Mr. Wolvin, will probably contribute about the same amount of money in the transportation of the remainder of the 1915 western crop to the Atlantic seaboard.

Mr. Wolvin calls for a further development of our Eastern Canadian shipping facilities, which "will turn into the coffers of Canada the ocean freights now being paid to others and we shall then retain the full price of the grain instead of so gracefully donating such a large proportion to others."

FINAL ESTIMATES FOR FISCAL YEAR

FINAL supplementary estimates for the fiscal year which closed on March 31, last, were tabled on April 12 by Sir Thomas White. They total $4,485,573 of which, $4,216,873 is chargeable to consolidated fund $40,000 to capital, and $228,664 to cover unimproved, unprovided items in the estimates for the previous fiscal year 1914-15. The various sums already granted by Parliament for the last fiscal year reached a total of $196,863,517 of which $150,734,042 was chargeable to revenue.

The supplementaries tabled to-day include the $1,550,000, paid in relief for settlers in Alberta and Saskatchewan, out of the proceeds of Governor-General's warrants; $245,700 for militia and defence; $1,500,000 for the Intercolonial Railway, and a number of small items.

TRADE COMPETITION AFTER THE WAR

THE President of the British Board of Trade has decided to appoint committees to consider the position of certain important British industries after the war, especially in relation to international competition, and to report what measures, if any, are necessary or desirable in order to safeguard that position. The following committees have accordingly been constituted:—

Iron Steel and Allied Industries

Sir Clarendon Hyde, Chairman; Mr. A. Balfour, Sir Hugh Bell, Bart., Mr. A. J. Hobson, Sir Hallowell Rogers, and Mr. Douglas Vickers.

Shipping and Shipbuilding Industries

Sir A. A. Booth, Bart., Chairman, Prof. W. S. Abell, Sir Archibald Denny, Bart., Sir Edward Hain, Captain H. B. Hooper, Mr. James Readhead, and Mr. Oswald Sanderson.

All communications relating to the above committees should be addressed to Percy Ashley, the Board of Trade, London S. W.

The consititution of a committee for textile industries will be announced shortly.

B. C. GOLD MINES PROSPER

DESPITE war the gold mining industry in British Columbia has been going ahead not only steadily but rapidly. This is shown by the report of the Dominion Assay Office of Vancouver for the fiscal year, which closed on March 31.

The total number of deposits of gold bullion received during the fiscal year ending March 31, 1916, was 1880 of the value of $2,789,350.71, an increase of 597 deposits and $684,214.59 in value over the amount of business transacted during the previous fiscal year; the total number of deposits received during the fiscal year ending March 31, 1915, being 1283, of the value of $2,105,136.12.

The assay office is evidently rendering satisfactory service to the gold mining community, and has by able and judicious management become a very important and practical help to the great mining interests in the West. The office was established in June, 1901, and the regulations governing the institution have been amended at different times to meet changing conditions, so that the Canadian gold miner would have a market for his bullion second to none on the continent.

FACING THE FUTURE

PROFESSOR RIPPER, of Sheffield University, had something to say recently anent conditions likely to prevail after the war. In the course of an address as president of the Sociological Society of the University, the doctor forecast, as most observers do, a great swing of the pendulum in the opposite direction to prosperity. On the conclusion of peace, he said, there will be a cessation to a large extent of the production of munitions, and a considerable number of men will revert to their original wages and trades. Overtime and war bonuses will cease, and there will be unemployment. Millions of men will be returning from the front to resume civil occupations, and the problem will be how to utilize those men.

In no period of our history had employers to face problems that presented more difficulties. In the past labor and capital had been opposed each to the other, but the old methods were not the best methods. The helpful services of co-operation in the production of war work ought to be retained. It was to be hoped that the old spirit of mutual distrust would pass, and that the lessons taught by the comradeship of the army and navy would be learnt in the workshops.

In future, business men would have to fight each other less and unite more. It would pay us as a commercial nation to adopt those measures. By the old methods, costs of production were enormously higher than they needed to be. The country was tired of the aggressive, domineering, blood-and-iron methods of conflict. The industrial rivalry of Germany would, added the doctor, continue after the war, and although we might prevent her gaining the freedom of our markets, such repression was merely negative. The positive thing which would determine our future and our relative position amongst the industrial nations would be our own efficiency in our men and in our methods as compared with our competitors.

GREAT BRITAIN CLOSES BIG COPPER CONTRACTS

CONSUMERS of copper in the United States were considerably disturbed recently when news came to the general trade that the British Government had closed contracts for the greatest tonnage of the metal ever sold in the country. It was learned that British agents after canvassing the copper situation carefully, had exercised options for between 200,000,000 and 300,000,000 pounds, at a price reported to be 27 cents. Expressed in tons, the order called for 100,000 tons at least, against the preceding high record purchase made last autumn of 60,000 tons. Deliveries will be made monthly during the remainder of the year according to a report in the trade, in quantities specified by the British Government as they are needed.

The Jeffrey Mfg. Co., Columbus, Ohio, have recently organized a new Contractor's Plant Department to handle the sale of a line of small rock and ore crushers, with which they will furnish their well known line of elevators, conveyers, screens, and loaders, etc. Leroy A. Kling, formerly sales manager of the road machinery department of the Wheeling Mold and Foundry Co., Wheeling, W. Va., will be in charge of the new department.

The Amalgamated Ammunition Machinery Co., Toronto, has increased its capital stock to $500,000.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Electrical

Appin, Ont.—The Council is contemplating the installation of an electric lighting system.

Glencoe, Ont.—The Town Council proposes to obtain estimates on the installation of a hydro system.

Engineering

Merritton, Ont.—The Riordon Pulp & Paper Co., will build an addition to their mill here.

Hamilton, Ont.—The Canadian Hart Wheels Ltd., will build an extension to their plant here.

Drummondville, Que. — The Aetna Chemical Co., will build a plant here for making sulphuric acid.

Niagara Falls, Ont. — The Pollard Mfg., Co., will build a foundry at an estimated cost of $10,000.

Kirkland Lake, Ont. — The Buffalo Mines are in the market for electric motors and an air compressor.

Merriton, Ont.—The Riordon Pulp & Paper Co., will lay 1,500 feet of 30 in. cast iron pipe at their plant here.

Toronto, Ont.—The Gurney Foundry Co., will erect an addition to their plant on Junction road at a cost of $2,500.

Toronto, Ont. — John Whitfield and Co., will erect machine shop and pattern storage on Front street, at a cost of $3,600.

Belleville, Ont.—The Belleville Rolling Mills are now operating the 18 in.. mill and will shortly have the 9 in., mill working.

Niagara Falls, Ont. — The Blystone Mfg. Co., of Cambridge Springs, Pa., has purchased a site here, and will commence within the next few weeks the erection of a plant for the manufacture of concrete machinery, tools, etc.

Fort William, Ont. — D. W. Davies, manager of the Canada Iron Foundries, has announced that instructions had been received from the head office of the company in Montreal to open the pipe foundry at once. This will mean that the entire plant will be running to full capacity.

Port Moody, B.C. — Boyd's Ltd., has secured a site 400 x 1100 ft., here and will erect a shipbuilding plant to cost $200,000. The plant will comprise a steel foundry, machine shop and woodworking plant. Provision will be made for launching three ships. Capt. Harry Mowatt will be manager.

Walkerville, Ont. — The Chalmers Motor Co., of Detroit, Mich., which recently obtained a Canadian charter, with a capitalization of $1,000,000, is to establish its Canadian branch plant here. A deal has been closed for the purchase of the plant of the Tate Electric Co., for that purpose.

Saskatoon, Sask.—The chalmers Motor Co., will make a large extension to their plant here. The main building will be 400 feet long, 60 feet wide and four stories high, to cost $510,000. It will have a wing, 60x50 feet, and with the recently completed service building, will add 156,000 square feet of floor space to the plant.

Municipal

Emerson, Man.—An electric light system will be installed here. The contract has been awarded.

Weyburn, Sask.—A by-law has passed to grant $35,000 for extensions to the electric light plant. E. H. Phillips is city clerk.

Sault Ste. Marie, Ont.—The City Council will shortly call for tenders for the erection of a power and pumping station, estimated to cost $7,500. Engineer, A. E. Pickering.

Brampton, Ont.—A by-law granting partial exemption to a new company who desire to establish a factory here for the manufacture of automobile tires was carried by a vote of 438 to 4.

Dundas, Ont.—A by-law will be voted on by the ratepayers on May 2 to authorize an expenditure of $55,995 on the construction of sewers and sewerage disposal works.

Wyoming, Ont. — A by-law will be voted on by the ratepayers on April 25 to authorize an expenditure of $6,500 on the construction of a new hydro-electric power and distribution plant.

Woodbridge, Ont.—A waterworks system is contemplated for this town which will include a pumping station and filtration plant. A by-law will be voted on to authorize an expenditure of $27,500.

Galt, Ont.—On April 28, two by-laws will be submitted to the ratepayers, one to raise $12,000 for the purchase of a motor fire engine and another to raise $16,000 for the installation of a fire alarm system.

Outremont, Que.—The City Council propose spending the following amounts on public works. Electric light extensions, $1,000; extension to water distributing system, $3,140; incinerator, $17,700; fire alarm systems at various schools $1,150, and an asphalt plant.

Personal

R. H. Lee has been appointed city engineer of Kamloops, B.C.

Wm. J. Chaplin, vice-president of the Welland Vale Mfg. Co., St. Catharines, Ont., died on April 11, aged 57.

J. W. Norcross, vice-president and managing director of Canada Steamship Lines, Ltd., has been elected a director of the Canadian Vickers Co. of Montreal, Que.

E. D. W. Courtice, assistant superintendent of the John Street Pumping Station, City of Toronto, has resigned his position to enter the employ of the Hare Engineering Co. as assistant engineer.

W. Chambers, formerly with the Chapman Double Ball Bearing Co., Toronto, has resigned his position as superintendent of the Cobourg Steel Co. of Cobourg, Ont., owing to ill-health, and will take an extended vacation.

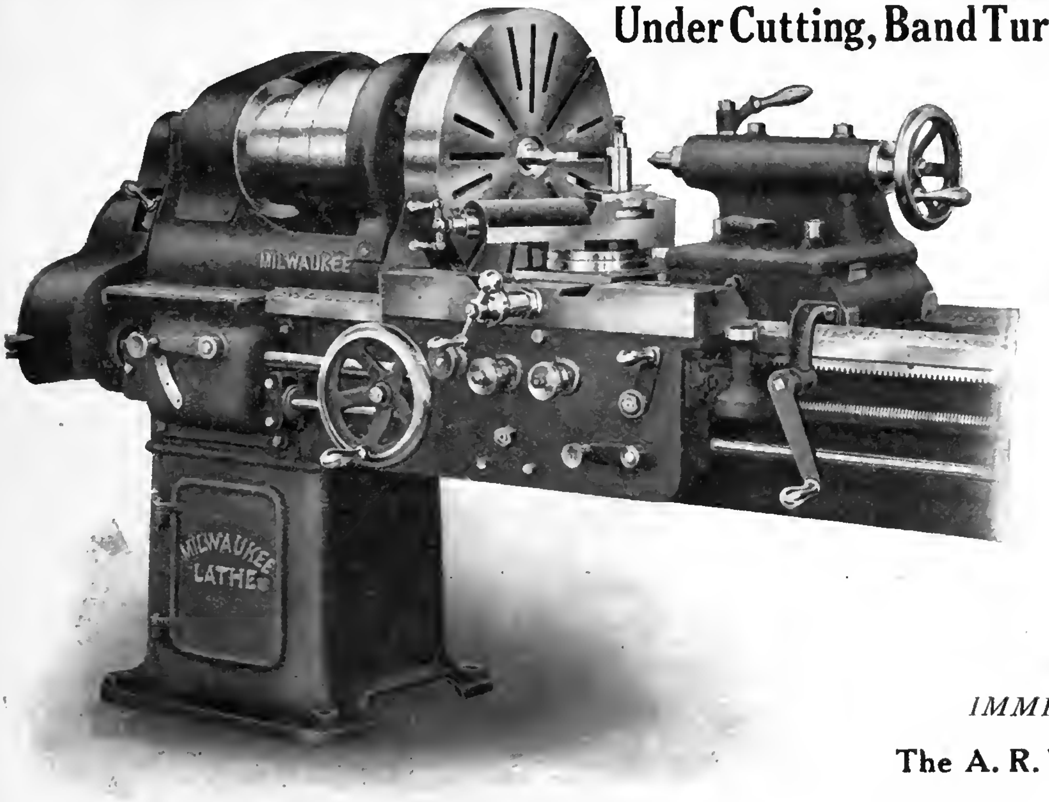
General Industrial

Quebec, Que.—The Dominion Corset Mfg. Co. will make an addition to their factory.

St. Catharines, Ont.—The Dominion Food Co. will build a factory here at an estimated cost of $20,,000.

Toronto, Ont. — The York Knitting Mills have been granted a permit to build a five-storey addition to their factory on Queen street at a cost of about $70,000.

24″ Standard Milwaukee Lathe for Finish Turning, Wave Grooving, Under Cutting, Band Turning and Rectifying



SPECIFICATIONS:

Swing over Bed.....	24½″
Swing over Carriage	15¾″
Dimensions of Front Bearing	3¾″ x 7″
Dimensions of Rear Bearing	3″ x 5″
Hole through Spindle	2 1-16″
Diameter of Spindle Nose	3½″
Pitch of Thread on Spindle	5
Diameter of Tail Spindle	2¾″
Taper Hole in Spindle Bushing.	No. 5 Morse
Cone Diameters ...	9¼″, 12⅛″, 15″
Width of Steps on Cone	4⅛″
Ratios of Back Gearing	3.45 to 1 & 12 to 1
Length of Carriage	30″
Width of Bridge	9½″
Pitch of Lead Screw	4
Cut Threads from	1 to 16
Size of Turning Tool	¾″ x 1⅜″
Depth of Bed	15″
Width of Bed	20″
Length of Tail Stock on Bed	17″
10′ Bed takes between Centers, with Tail Stock even with end of Bed	5′ 6″
Countershaft Pulleys	16″ x 6″
Countershaft should run ...	150
Net Weight with 10′ Bed..	5,600 lbs.

IMMEDIATE DELIVERY

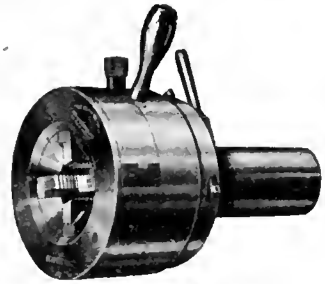
The A. R. Williams Machinery Co. Limited

TORONTO CANADA

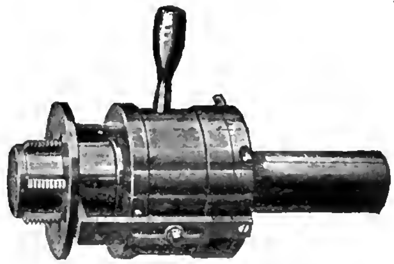
WHO KNOWS A BETTER?

"Our real reason for using Geometric Tools is the service they give—and we use them exclusively."

So says a Shop Foreman. He particularly mentioned a job, then in hand, of threading a piece 3¾ in. diameter, 11½ threads per inch, to shoulder. Between 400 and 450 such pieces were threaded daily. Each threaded piece an exact duplicate—correct in every particular.



Geometric Self-opening and Adjustable Screw-cutting Die Head.



Geometric Adjustable Collapsing Tap.

Whether it is an outside thread or an inside thread, of whatever diameter, length, pitch or form, a Geometric Screw-cutting tool will produce it. Whatever the make of your Screw Machine, a Geometric will fit it.

Let us know the class of thread-cutting that you have to do, and we will send booklet describing the type of tool best suited to it

THE GEOMETRIC TOOL CO., NEW HAVEN, CONN.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

Trade Gossip

The Garlock Machinery Co. have moved their office from 197 Wellesley Street to a more central location at 32 Front Street West, Toronto.

The Canada Steamship Lines are negotiating with the St Lawrence & Chicago Navigation Co., with a view to amalgamation. Details relating to the deal are being considered.

The Hare Engineering Co., Ltd., Toronto, Ont., have recently received a contract to instal their Fulton water-cooled mechanical stokers in the new plant being built by the York Knitting Mills, Ltd., of Toronto.

Francis Hawkin & Co., of Montreal have been awarded a contract for sluice gates and operating stands for a filter by the city of Chatham, Ont. The apparatus will be supplied by the Chapman Valve Mfg., Co., Indian Orchard, Mass.

Tonnage Shortage Grips Montreal.—Inquiries made in London concerning a possible solution of the tonnage problem now confronting Montreal make it clear that relief from England is not to be expected, as the shortage of ships becomes more marked daily.

Quyon, Que.—The Canadian Wood Molybdenite Co., who recently started operations at a mine containing molybdenum, about four miles from here, intend putting up a mill to smelt the ore on the spot, as the amount of ore in the mine has been far greater than was anticipated before operations were commenced. Work will be commenced immediately upon the building.

Toronto Harbor Improvements.—At a conference between the Board of Control and Harbor Commissioners on April 3 a decision was reached whereby the latter will spend $500,000 in improvements. Filling will be done at Humber Bay, Queen's Wharf, Hanlan's Point, Ward's Island and the Royal Canadian Yacht Club. In addition to this, $2,000,000 will be spent in the Ashbridge's Bay industrial district.

Britain Prohibits Export of Pig Iron.—The British Government on April 14, proclaimed an absolute prohibition of the export to any destination of all kinds of steel. The prohibition on steel applies especially to the variety used by railroads and shipbuilders, including rails, sleepers, springs, wheels, axles, tubes, girders, ingots, bars, angles and rods, and of plates more than an eighth of an inch in thickness.

Fort William, Ont.—Announcement is made that the mines and blast furnaces of the Atikokan Iron Co. will be running full blast this summer. On account of the difficulty in the treatment of the ore, it was found necessary to close the plant a few years ago, but a remedy for getting rid of the sulphur in the ore has been found, and the company expects to commence work at once, having found a remedy for treating the ore

Canadian Copper Output.—The Canadian Copper Co. of Copper Cliff, Ont., produced 99,656,000 pounds of nickel copper matte in the twelve months ending December 1, 1915, according to Hon. G. Howard Ferguson's reply to a question in the Ontario Legislature from Sam Carter, South Wellington. The Mond Nickel Co. in the same period produced 35,750,000 pounds. In that year the Mond Nickel Co. paid $4,000 tax on profits under the Mining Tax Act.

To Provide Bounty on Canadian Zinc.—Sir Thomas White on April 11 gave notice of a resolution providing for the payment of a bounty of two cents per pound on zinc or spelter, produced in Canada from zinc ores mined in Canada. The bounty is to be the difference between the standard price in London and a maximum of £36 19s. 3d. per ton. No bounty is to be paid when the price of zinc or spelter is eight cents per pound, none is to be paid during the war, and in no event is there to be a bounty on zinc produced after July 31, 1917. The total amount payable under the resolution is limited to $400,000.

Munition Workers' Commission.—Judge Snider, of Hamilton, Ont., has been appointed chairman of a special Commission appointed by the Government to investigate conditions in Toronto and Hamilton munition factories. The other members of the Commission are William Inglis, of the John Inglis Co., Toronto, and John McClelland, of Montreal, vice-president of the International Association of Machinists. The intention of the Commission is to allay such unrest and improve conditions among the munition workers, so that there will be no cessation in the operations of the plants engaged in this class of work.

Canadian Timber at Port Nelson.—That some 5,570,851 feet of Canadian timber have been used in connection with work at Port Nelson, as compared with 4,559,637 feet of United States timber, was the statement made by Hon. Dr. Reid in reply to Hon. George P. Graham in the House at Ottawa on April 13. The American wood used was long leaf yellow pine, oak, hard pine and Oregon pine. That the cost of transporting freight to Port Nelson has been reduced to one-fifth what it was originally was also shown. In 1913 the average cost of freight per ton to the port was $56.65; in 1914 it had been reduced to $13.39, and now it is only $9.62, with a direct lightering charge of $2.50 per ton at Port Nelson.

Canadian Patents.—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 59 Yonge street, Toronto; Robert Washburn, sash lifter; Edwin J. Banfield, plug finishing machine; James A. Varley, dummy rifle and bayonet; Toronto Type Foundry Co., folding plates for folding machines; John Fox, grain pickler; Gibson Groves, fire alarm system; George Henderson, electro-magnetic signalling apparatus; Fred. Rawlings, road planer and surfacer; Gutta Percha & Rubber Co., process of moulding and vulcanizing tires; Gutta Percha & Rubber Co., tire moulding machine; Reuben A. Shaver, grain car door; Emil C. Boeckh, broom; Albert T. Hughes, protectors and non-skidding bands for wheel tires; Samuel Glover and John West, gas producer; Charles O. Bastian, electric incandescent bodies for glow lamps; Edward B. Killen, pneumatic shock absorbing devices.

Tenders

Burlington, Ont.—Tenders will be received up to Saturday, May the 13th, 1916, for two-ton combination chemical engine hose truck. Specifications on application. Jas. S. Allen, Clerk.

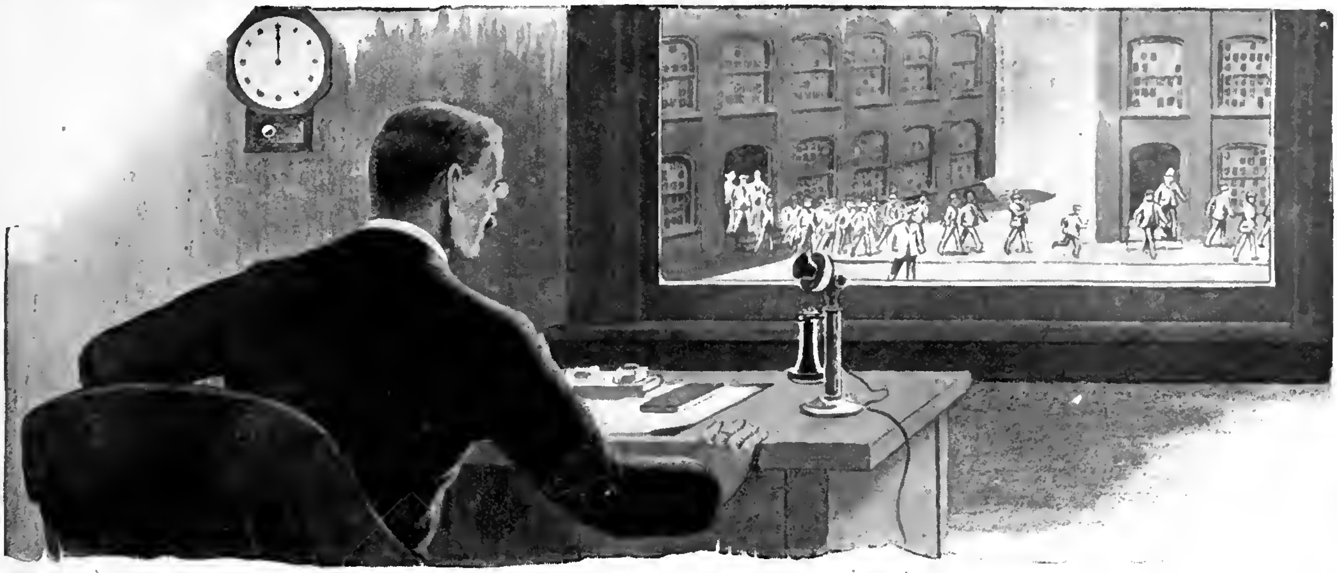
Dartmouth, N.S. — Tenders for the completion of a foundry for the Williston Steel Foundry Co., are being received by the C. Hedley Williston, 504 Robie St., Halifax, N.S. Estimated cost $16,000.

Toronto, Ont.—Tenders for steel furnishings for the new Registry Office will be received up to Tuesday, 25th April, 1916. Plans and specifications may be seen and forms of tender and all information obtained at the office of the City Architect, City Hall.

Calgary, Alta.—Tenders will be received up to Thursday, April 27th, 1916, for the supply and delivery of underground pot heads, junction boxes, switch board type, knife switches and storage battery material. Specifications at the office of the City Electrical Engineer,

Sherbrooke, Que.—Tenders will be received until April 29th, 1916, for a power pump of the capacity of four million Imperial gallons per twenty-four hours; also a vertical water wheel, flume, shaft, brackets, etc., to operate the above-mentioned pump. Specification and plan can be seen at the office of City Engineer Tremblay, Sherbrooke, P.Q.

Toronto, Ont.—Tenders will be received by the Chairman of the Board of Control, up to Tuesday, April 25, 1916, for the excavating, laying and jointing



of water pipes, valves, hydrants and special castings, for the year 1916. Specifications and tender forms for the foregoing may be obtained upon application at the office of the Water Main Extension Section, Department of Works, Room No. 320, City Hall.

Ottawa, Ont. — Tenders for metallic fittings for New Customs Offices and Examining Warehouse, Sussex street, Ottawa," will be received until Thursday, April 27, 1916. Plans, specification and forms of tender can be obtained on application to the office of Edwin Francis, Caretaker, Postoffice, London, Ont., R. L. Deschamps, Overseer of Dominion Buildings, Postoffice, Montreal; Thos. A. Hastings, Clerk of Works, Postal Station "F," Toronto, and at the Department of Public Works, Ottawa.

Victoria, B.C.—The Dominion Government is calling for tenders for the erection of buoy, store and freight sheds, trackage and drainage, etc., on the marine wharf site. Full particulars and specifications of the proposed buildings can be obtained from the local offices of the Department. All tenders must reach Ottawa by April 26 next. The plans for the proposed buildings cover a connected freight shed 147 feet by 30 feet. A commodious store shed is to be erected, and will be 108 feet by 36 feet. A buoy shed, measuring 80 feet by 40 feet, to which will be attached a shed 80 feet by 20 feet, for the use of carpenters, gas-buoy men and as machine shops, is also covered by the tenders.

Contracts Awarded

The Ottawa Electric Railway Co. have awarded a contract for track material to the United States Steel Products Co., Montreal.

St. Thomas, Ont.—The city council have awarded contracts for fire hose to the Dunlop Tire Co., and the Goodyear Tire Co.

Mount Dennis, Ont.—The school trustees have awarded the following contracts for the new Silverthorne Public school: Steel sash, Hope & Son; steel stairs, McGregor & McIntyre; heating and plumbing, George Sainsbury; galvanized iron and roof, W. E. Dillon Co.; electric wiring, W. Moon & Co.

North Vancouver, B.C.—The Vancouver Creosoting Co. has let the following contracts for work in connection with its new plant at North Vancouver: Steel rods, etc., to Balfour, Guthrie & Co.; boilers, to the Vancouver Engineering Works; and a number of tanks and condensers, to the Ross & Howard Iron-works.

Building Notes

Hamilton, Ont.—The Board of Control will probably call for new tenders for the building and equipping of the new Nurses' Home for the Mountain Hospital.

Railways—Bridges

Vancouver, B.C.—The general plan, as submitted to the bridges and railways committee of the City Council for the C. N. R. station to be erected east of Main Street, on the railway property, has been tentatively approved by the committee, and its approval by the City Council been recommended. The cost of the proposed terminal will be at least $1,000,000.

Marine

Sarnia, Ont.—The whole dock of the Northern Navigation Co. in this city, about 900 feet in length, will be rebuilt. Last year part of the structure was rebuilt, but now orders have been received to put in the whole length new.

Canada Steamship Line Officers.—The commanders of the steamers of the Canada Steamship Line Niagara fleet are: Cayuga, Captain, C. J. Smith; chief engineer, A. Mains; Chippewa, Captain, William Malcolm; chief engineer, H. Parker; Corona, Captain, B. A. Bongard; chief engineer, Joseph Kennedy. Toronto-Charlotte and Montreal division: Toronto, Captain, John J. Farrell; engineer, D. J. Leslie; Steamer Kingston, Captain, E. A. Booth; chief engineer, William Chipman. Toronto and Hamilton division, Modjeska, Captain, P. Walsh; chief engineer, A. McLaren; Macassa, Captain, J. Henderson; chief engineer, E. A. Price; Turbinia, Captain, B. W. Bongard; chief engineer, William Noonan.

Wood-Working

Gore Bay, Ont.—W. E. George proposes to erect a planing mill.

Three Rivers, Que.—Anseline Dabe, of this town, is in the market for wood-working machinery.

Elmira, Ont.—Bauman & Letson will rebuild their sash and door factory which was recently destroyed by fire.

Montreal, Que. — The Miner Lumber Co., Coristine Building, is in the market for wood-working lathes.

St. John's, Que.—The furniture factory of D. H. Langlois & Co. was recently destroyed by fire. Loss, $16,000.

Refrigeration

Montreal West, Que.—The Elmhurst Dairy Co. are building a refrigeration plant.

Killarney, Man.—Mr. Stainton, manager of the Crescent Creamery Co. of Winnipeg, has completed arrangements for the erection of a creamery at this point. A $5,000 plant, including mechanical cooling machinery, will be installed to start with. Butter making only will be engaged in at first; later an ice cream business will be installed should the business warrant it. Building operations will be commenced at once.

Catalogues

The Babbitt Specialty Co., New Bedford Mass., have issued a leaflet illustrating and describing "Babbitt" adjustable sprocket rim for attaching to the wheel of any valve. A price list is included for rims and chains.

Foundry Cupolas.—Catalogue No. 118, describes and illustrates foundry cupolas made by the Whiting Foundry & Equipment Co., Harvey, Ill. The Whiting cupolas are described fully and special features of their design dealt with in detail. The illustrations show the construction and new improvements. A table of dimensions and capacities is given, and code words for the various sizes are also included. Other equipment illustrated and described include charging machines and cars, bottom door hoists, blast gauges and fire brick linings, etc.

Monetary Times Annual Statistical Review and Outlook Number, edited by Fred W. Field. Published by the Monetary Times Printing Co., Toronto, Ont. Price 50 cents. The review this year is of special interest, as it covers a period when the financial and industrial situation in Canada has been greatly affected by the war, and unforeseen circumstances have resulted in many difficult problems arising, which have had to be dealt with from time to time. The manner in which some of these problems have been handled is dealt with in a series of articles written by well-known authorities on financial and commercial matters. Other interesting subjects covering similar ground, irrespective of the war and its effects, are also dealt with in a comprehensive manner. The volume is divided into four sections, with a preliminary financial review. The sections are devoted to banking, bonds and investments, insurance, and industrial matters; the latter section including an interesting article on the Nova Scotia Steel & Coal Co. The review contains a number of interesting statistics, diagrams and illustrations.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

SIX-FOOT METAL PLANER FOR SALE—practically new. Apply A. Graham Boyd, 100 Front St. E., Toronto. (14)

TWO FOX TURRET LATHES FOR SALE—splendid condition. Ideal Foundry, 960 Gerrard St. East, Toronto. Phone Gerrard 1055. (15)

1—2-SPINDLE SHAPER, WOOD TOP, JOHN Ballantyne, Preston, make. used two months. 1 Dynamo, 45 lights, Toronto and Hamilton Electric Co. make. Used five months. Good as new. Box 195, Jordon, Ont. (R.T.F.)

FORD-SMITH NO. 2 PLAIN MILLING MAchine; new; in perfect condition; ready for immediate shipment. McGregor & McIntyre, Ltd., 1139 Shaw St., Toronto. (16)

FOR SALE—FIFTEEN HUNDRED GALLON Duplex Steam Pump, used sixty days. Size twenty x twelve x sixteen stroke. Apply Fraser & Chalmers of Canada, Limited, Montreal. (12)

FOR SALE—GARAGE IN GOOD WHEAT district. Snap for a good, practical man. About forty cars in vicinity. Will sell cheap if taken at once. Address Box 74, Hanley. Sask. (13)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London. Ont.

1—C.G.E. TYPE 10—20 H.P. INDUCTION Motor—60 cycles, 220 volts, 45 amps.—1200 R.P.M., complete with Auto Starter. Pulley on Motor 12" Diam. x 10" Face. Cummer-Dowswell, Ltd., Hamilton, Ont.

FOR SALE—ONE NEVER-USED WESTINGhouse Motor, Type CCL, 5 H.P., 200 Volts, 16 Amperes, 3 Phase, 3000 Alts., 700 R.P.M., full load, equipped with starting compensator and frame and 6" pulley with 5" face. Canadian Machinery, Box 189. (16)

FOR SALE

Second-Hand Pipe Threading and Cutting Machines

Two No. 2 (Murchey Type) Semi-Automatic double head Nipple and Pipe Threading Machine, ½-inch to 2-inch inclusive, complete with Countersunk Pulleys, etc.

Two—New Rapid Upright Roller Pipe Cutters (Murchey Type), ½-inch to 2-inch inclusive.

One—Heavy Duty Pipe Cutter (Murchey Type), 1½-inch to 4-inch inclusive.

One—No. 4 (Williams Type), Power Pipe Machine, 2½-inch to 8-inch inclusive, all complete.

One—No. 12 Power Pipe Machine, 4-inch to 12-inch inclusive.

Apply Box 188
CANADIAN MACHINERY

FOR SALE

Fox Monitor Lathe, 18" x 5' 6", 9-hole turret, cross feed, hollow spindle, 5-step cone; good as new. Plating dynamo, 6 volts, 250 amp.; used only a short time.

PENDRITH MACHINERY COMPANY
970 Queen St. West, Toronto (15)

FOR SALE

FOR SALE—PLANING MILL AND FACTory, doing good business. Terms $2,000.00 cash. Balance to suit buyer. Address O. Ribble, Bronte, Ont. (13)

AUTOMOBILE BUSINESS AND NEW Garage for sale. Overland agency; lots of repairing; also Overland roadster, new tires, $300.00; 10 light D.C. generator, $25.00; K.W. magneto (new), $15.00. W. E. Hawes, Otterville, Ont. (13)

FOR SALE—1 CLEVELAND ACME MAchine Co.'s 6" Cap, Single Head, Tapping Machine—back-geared, automatic feed, cone step pulleys and countershaft with two extra chucks. Particulars from Taylor-Forbes Company, Limited, Guelph, Ont. (13)

FOR SALE, AT A SACRIFICE—SAW MILL outfit, A1 condition; 50 H.P. stationary boiler. 45 H.P. "Leonard" engine, "Green" carriage, Simonds saw, edger, planer, lathmill, etc. Easy terms. Write quick. R. Parker & Sons, Uno Park, Ont. (12)

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double bandsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

ELECTRODES — THE PROPRIETORS OF letters patent No. 127080, relating to "Process of manufacturing iron for use in alkaline accumulators," and No. 127081, relating to "Active masses for positive electrodes of electric elements, etc.," desire to dispose of the patents or to grant licenses to interested parties at reasonable terms, with a view to the adequate working of the patents in Canada. Inquiries to be addressed to the actual proprietors, Svenska Ackumulator Aktiebolaget Jungner, Stockholm, Sweden. (13)

SITUATIONS WANTED

MECHANICAL SUPERINTENDENT, EFFICIency engineer and master mechanic having twenty years' experience in all lines of general machine, blacksmith, carpenter and pattern shop practice, foundry work, power plant, refrigerating and electrical engineering, is open for engagement. Box 177, Canadian Machinery. (11)

CHIEF ENGINEER — 26 YEARS' EXPERIence. Factory and Central Station, Alternating and Direct Current, Gas or Steam Engines, efficiency guaranteed, own instruments, best of references. Box 181, Canadian Machinery. (12)

AS MAINTENANCE ENGINEER OF FACTory, power or lighting plant, where economy is a factor, wide experience, best of references. Box 180, Canadian Machinery. (12)

WANTED

Burned out Tungsten Lamps, late type, drawn wire, 25, 40, 60 and 100 Watts, 110 and 115 volts.

DOMINION TUNGSTEN LAMP FACTORY
ST. CATHARINES, ONTARIO

REPAIRING

ALL KINDS OF MACHINERY REPAIRED, rebuilt and installed. W. H. Sumbling Machinery Co., 643 Yonge street.

SITUATIONS VACANT

WANTED—YOUNG MAN TO HANDLE ADvertising of a line of engineering equipment. Must be prepared to locate in a city of 15,000 population. Salary to start, $70 per month. Box 184, Canadian Machinery.

WANTED — MACHINISTS AND FLOOR hands on heavy and miscellaneous medium work; steady employment, modern shop, good wages. Apply, stating age and experience, P.O. Box 6, Walkerville, Ontario. (6)

WANTED

WANTED — TWO FIRST-CLASS STEEL moulders. Apply Nova Scotia Steel & Coal Company, Limited, Sydney Mines, N.S. (15)

WANTED—OUTSIDE MACHINIST TO ACT as mechanical foreman on construction work. Apply to A. B., Canadian Machinery. (15)

WANTED — YOUNG CHEMIST WHO HAS had some experience in analysis of iron, steel and other steel plant products. Apply to X. Y., Canadian Machinery. (15)

WANTED—FIRST-CLASS BOILER MAN TO take charge of battery of water tube boilers, 1200 H.P., which will be increased. Should be familiar with steam engine and air compressor. Reply, giving particulars of experience and salary expected, Box 191, Canadian Machinery. (19)

PATENTS

TAKE NOTICE THAT THE STANYON Metallic Furniture Co., Limited, of the City of Toronto, Canada, duly manufactured the movable grate covered by Canadian patent No. 101997, and that the Bennett & Wright Co., Limited, of the same city, duly manufactured the hot water heater covered by Canadian patent 107120 prior to the period called for by the Patent Act, and on application to the undersigned any further orders for the two above inventions will be filled at a reasonable price. Ridout & Maybee, 59 Yonge Street, Toronto, attorneys for Anders B. Reck.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, APRIL 27, 1916 No. 17

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.
H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Metal Coating Processes: Their Application and Apparatus

Staff Article

Metal coating is a mechanical process as distinguished from electro-plating and dipping in molten metals which processes exert more or less of an alloying influence between the work and the coating. The processes described cause the metal to impinge so violently as to intermesh with the surface particles of the substance being coated, at a temperature and under conditions which allow of its application to non-metallic, perishable and delicate materials.

THE protection of metals from oxidation has long occupied the attention of chemists and metallurgists. Many methods and processes have been developed and utilized, with varying degrees of success, but in every instance their usefulness has been confined within certain limits: both to the metals or objects coated, and also to the coating materials.

With the exception of the higher classes of electro-plating the only two notable examples which have been extensively used in the industrial field are those of galvanized zinc and tin covered sheets; and even with the limitations imposed by lack of scientific knowledge up to this time, millions of dollars have been invested, and made, with these two metals, acting upon sheets of iron brought to the coating medium, and individually handled. However, even these processes with all their other limitations could not be successfully carried out with some metals, and no coating could be made on fabric, wood, glass, etc.

Recent Developments in Metal Coating

Probably the most recent method, and also the most promising for commercial and industrial purposes, is that of the Schoop process. For many years Dr. Max Ulrich Schoop, of France, carried on research and experimental work along

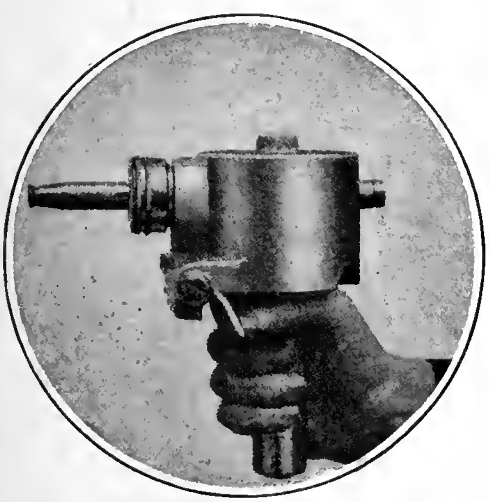


FIG. 1. METAL COATING PISTOL WITH AUTOMATIC WIRE FEED AND BLOW PIPE COMBINED.

these lines, which has recently been developed by the present holders of the process patents to such a degree that the uses to which this process can be adapted are almost innumerable.

With this latest method—in contradistinction to all other methods— it is not necessary to bring the object to be coated, to the coating medium; the process can be successfully applied under any condition. No surface of any nature whatever will be too small, nor too large, to receive a coating of almost any metal, varying in thickness from 1-1,000 of an inch to as thick as may be desired. In other words, the applications of this discovery are revolutionary in character and have evoked the wonder and admiration of the scientific and industrial world, in the possibilities opened up for their use and application.

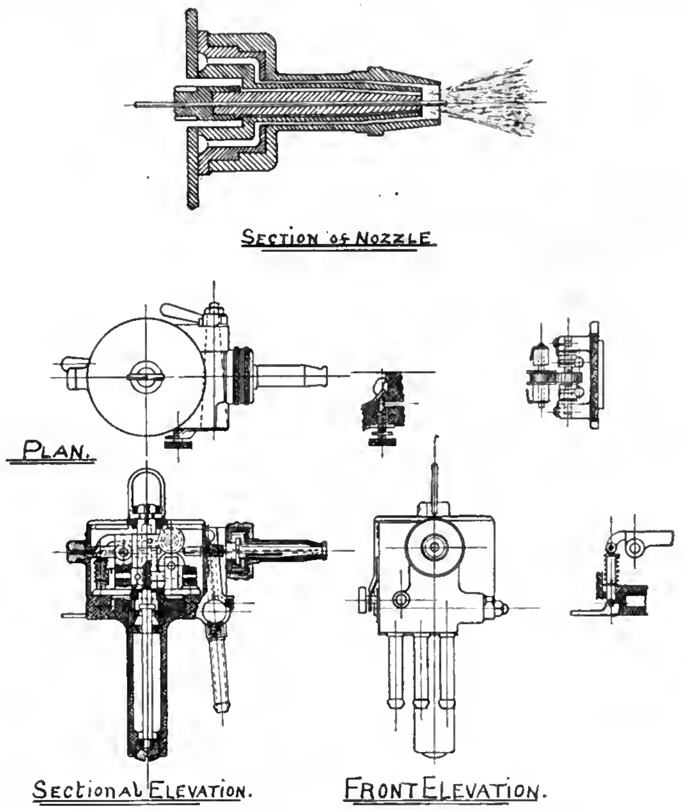


FIG. 2. DETAILS OF PISTOL CONSTRUCTION.

Light and Serviceable Equipment

The necessary equipment for this process of metal coating, is a supply of oxygen and hydrogen, and a specially constructed "pistol," shown in Fig. 1. The operation of this "pistol" will be more clearly understood by referring to Fig. 2, which illustrates the internal details of nozzle and operating mechanism. This interesting portion of the "pistol" consists of a minuiature air motor, with straightening and centering device, also a set of rolls for feeding the wire through the "pistol." These feed rolls can be operated at two different speeds, according to the nature of coating metal being used and the grade of coating desired. When the oxygen supply enters the "pistol" it divides into two channels, one leading to the nozzle, and the other into the operating motor. The sectional cuts shown in Fig. 2 are views of the most recently developed type of "pistol," used for disintegrating a wire of any metal and projecting the molten particles thereof on to a surface so that they are in intimate contact therewith.

The theory of the Schoop process, as given by the inventor is, that the gaseous medium used is much larger in volume at any moment than the drop of metal it has atomized and is carrying, and the gas is expanding so rapidly that its temperature is far lower than that of the spray. A rapid exchange of heat therefore, takes place between them which consolidates the molten particles and gives them a temperature far below the melting point. If the particles arrived in a liquid state at the base with the observed velocity of 3,000 feet per second, they would simply splash on the surface and largely rebound. As a matter of fact, they impact and inter-penetrate freely, and later bombarding particles unite with the earlier ones to form a homogeneous compact body.

"Gravitas" Method of Application

The latest development along these lines is that shown in Fig. 3 which is the "Gravitas" (trade mark) type of machine, in which the metal to be used

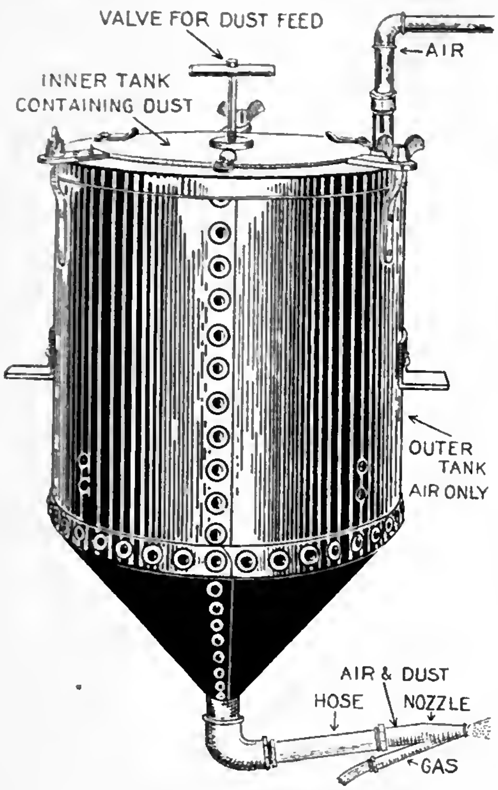


FIG. 3. DOUBLE TANK APPARATUS FOR USE WITH METALLIC DUST PROCESS.

for coating is finely pulverized before being applied. In this apparatus, the inner tank contains the metal dust, and the outer portion, the air: the supply of metal dust is regulated by the valve shown in the centre of the tank which communicates with the outlet at the base. The mixture of air, dust and gas is then ignited and applied similarly to that described above.

In all cases of metal coating it is advisable to have surfaces thoroughly cleaned before applying the spray: in fact, to insure satisfactory work it is essential that the surface be entirely free from any dirt, grease or other impurities. It may be found necessary, therefore, under certain conditions, that surfaces will require to be sand-blasted or otherwise cleaned to remove any objectionable feature that would prevent the satisfactory application of the coating material.

An interesting feature in connection with the use of this method of metal coating is noted. This is the use of the Schoop system of metalisation for imparting a metallic polish to the surface of enemy airships. The nose end of the envelope is coated for about one fifth of the ship's length, and considerable increase in speed is obtained due to the decreased skin friction between the surface and the atmosphere.

Tables 1, 2 and 3 set forth the relative cost of various coatings under different conditions. These costs, however, are based on the price of metals under normal conditions before the opening of European hostilities.

Unlimited Field

The uses of the processes are so wide that to enumerate them all would be to index all the arts and sciences. The general application for electrical purposes is unlimited, and for construction and industrial purposes this method of applying non-corroding metal will be indispensable, taking the place of the now expensive and easily destructive paints and varnishes. In fact the process can be adapted to such universal advantage that it is almost impossible to conceive the entire range; even the long sought "putting on tool," of the careless mechanic is now available.

Experimental Laboratory

Fig. 4 shows a view of the temporary laboratory in Montreal; a large variety of articles are here shown which have been coated with various metals. The operator on the left is seen spraying a 4.5 shell with a coating of zinc, while the operator on the right is coating a smaller shell, by the "Gravitas" process.

TABLE 2—COST TO COVER ONE SQUARE FOOT BY SPRAYING.

Metal	Diam., inches	Speed of wire in ft. per min.	Time to cover one sq. ft. Min.	Sec.	Thickness inches	Cost of spraying	Cost of wire	Total cost
Copper	.032	12	1	10	.001	$.021	$.0076	$.0286
Brass	.032	12	1	10	.001	.020	.0071	.0271
Bronze	.032	12	1	10	.001	.024	.0101	.0341
German silver	.032	12	1	10	.0089	.024	.0105	.0345
Aluminum	....	16	..	40	.001	.0128	.0042	.0170
Zinc	....	18	..	30	.0015	.0081	.0115	.0196
Lead	.076	25	..	25	.002	.0064	.021	.0274
Tin	.062	25	..	30	.002	.0088	.0875	.0963

TABLE 3—COST OF SPRAYING ONE POUND.

Metal	Feet per pound	Speed of wire in feet per min.	Time to spray one lb. Min.	Cost of spraying	Cost of wire	Total cost
Copper	340	12	28	$ .50	$.1725	$ .6725
Brass	350	12	28	.47	.1625	.6325
Bronze	244	12	28	.53	.2225	.7525
German silver	330	12	28	.51	.25	.76
Aluminum	761	16	48	1.075	.37	1.445
Zinc	283	18	14	.227	.33	.557
Lead	50	25	2	.032	.10	.132
Tin	105	25	4	.07	.70	.77

ECONOMIC CONFERENCE OF THE ALLIES AT PARIS

ON THURSDAY, April 27th, there will be opened at Paris the International Parliamentary Economic Conference of the Entente Allies for the purpose of discussing the advisability of advance agreements among the Allies concerning all legislative measures intended to regulate commercial relations between the belligerents. The subjects to be discussed will include the following:

The execution of contracts, the collection of debts, sequestration of goods and chattels, the question of patents and kindred subjects; measures of precaution against the invasion of the markets of the allies by German products upon the conclusion of peace; measures for repairing the damages of war; reduction of postal, telegraphic and telephonic rates, and the establishment of a minimum tariff in favor of the allies; agreements in regard to the international transportation of merchandise; the creation of an international patent bureau; commercial affairs of the col-

TABLE 1—DETAIL COST OF USING PISTOL ONE HOUR.

Metal	Diameter inches	Speed of wire in feet per min.	Pounds per Hr.	Oxygen Gauge pressure	Oxygen Cubic feet	Cost at $.02 cu. ft.	Blau Gas Gauge pressure	Blau Gas Cubic feet	Cost at $.008 cu. ft.	Labor per Hr.	Cost of air per Hr.	Cost of spraying	Wire cost per Hr.	Total cost per Hr.	Total cost per Min.
Copper	.032	12	2.15	27	24	$.48	25	13	$.104	.30	$.20	$1.08	$ .366	$1.446	$.0241
Brass	.032	12	2.15	28	21	.42	26	14	.11	.30	.20	1.03	.335	1.365	.0228
Bronze	.032	12	2.15	27	24	.48	25	14.4	.116	.30	.20	1.09	.432	1.522	.0253
German silver	.032	12	2.15	28	23	.46	26	14	.11	.30	.20	1.08	.545	1.625	.0271
Aluminum	.0375	16	.12	19	36	.72	16	13	.104	.30	.20	1.32	.44	1.76	.0127
Zinc	.0375	18	4.3	15	20	.40	13.5	10	.08	.30	.20	.98	1.23	2.21	.0368
Lead	.076	25	.30	14	20	.40	12	8	.064	.30	.20	.964	2.00	3.964	.0661
Tin	.061	25	.15	13	24	.48	14	10	.08	.30	.20	1.65	10.50	11.56	.1933

onies of the allied nations; internationalization of the law governing corporations: measures destined to reduce metallic circulation; the institution of an international clearing house; uniform principles to be embodied in laws relative to the false designation of merchandise; laws concerning failures; legislation relative to the loss or theft of securities payable to bearer.

The discussion of these questions will occupy the three days' session.

FIG. 4. VIEW IN EXPERIMENTAL LABORATORY SHOWING A VARIETY OF THE APPLICATIONS.

THE POSSIBILITIES OF SHIPBUILDING IN CANADA

A NOTABLE contribution to the literature on the possibilities of shipbuilding in Canada was made on April 19 by Col. Thomas Cantley, president of the Nova Scotia Steel & Coal Co., and vice-president of the Canadian Manufacturers' Association, at a dinner given by the Montreal Branch of the Association at the Canada Club. Col. Cantley discussed the shipbuilding problem as follows:

The Shipbuilding Problem

Marine transportation at the present time is a matter of vital interest both to Canada and the Empire. The losses of British merchant shipping tonnage during the past twenty months of this war have amounted to more than two and a quarter million tons—the losses during several months averaging over two steamers per day. We have recently lost more shipping in one week than the shipbuilding resources of Great Britain produces in three months. These losses, coupled with the transportation demands of Britain and the Allies, and the inevitable law of supply and demand, have caused freight rates and the value of ships to advance from five to fifteen times over those formerly paid. So long as the present war and the transportation problems arising out of it continue, no relief can be expected from outside sources.

On the Great Lakes Canadian shipping amounts to only a small fraction of the lake tonnage. On the ocean, Canadian ships carry less than one-tenth of the produce sent out of Canadian ports, while very large quantities of other Canadian products pass through American ports. It is estimated that, before the war, Canadians were paying over $50,000,000 yearly in ocean freights, almost all of which went into the pockets of foreign ship owners.

Overseas Trade Expansion

If we assume that there will be a very large volume of immigration to Canada after the war, doubtless a considerable proportion of this influx will settle on the land, principally in the West, and at a reasonable time thereafter there should and undoubtedly will be a very large increase in our exports of agricultural products. Of the four to five hundred thousand Canadians returning from the battle-front when the enemy is defeated, a large number, both by previous training and inclination, will expect to find employment in the various workshops of the Dominion.

The success of our railway transportation system has been due largely to the vigorous and resolute policy of our Governments in the matter of railway development, which contributed the Intercolonial Railway, and latterly the Transcontinental system—our investment in which exceeds $200,000,000. Public aid has been given to private railway systems to an even greater extent, and guarantees of bonds have been made to an amount closely approaching $300,000,000.

As regards marine transportation, we have had no such policy. We have constructed a canal system that since Confederation has cost us over $100,000,000, but the canals so constructed are open to our competitors and over four-fifths of the traffic passing through the Canadian canals originates in the United States, and less than one-third of the ships using the canals are Canadian. In addition to the expenditure on canals, Canada has spent something like $150,000,000 in aids to navigation on the Atlantic and Pacific coasts and on our inland waters.

Industrial Policy

Personally, I have but little faith in the success of any scheme for providing greater or more efficient transportation either through Government ownership, time charter or operation of a tramp steamer fleet, or by any other form of attempted control of ocean traffic by the Government. On the other hand the Dominion would be justified in making some considerable expenditure by way of aiding in the development of Canadian shipbuilding at the present time.

The iron and steel industry of Canada could never have reached the present output capacity save for the fostering influence of the combination of tariff protection and bounty, and I take it we have reached the position in Canada where even the most out and out "free trader" will admit that any sacrifice made by Canada to establish the steel industry has been fully warranted by the experience of the past eighteen months, for I assume that it will be agreed that if the iron and steel industry had not been developed in this country as it was, no munition business would have been possible in Canada to-day, and in that case the financial situation of the Dominion and the industrial condition in the large manufacturing centres would be quite different from what they are at this moment.

I am confident that when a return is made by the Minister of Finance it will be shown that the tax on the excess profits collected from munition and iron and steel manufacturers, will, before the war is ended, equal the entire total bounties paid out by the Dominion Government to iron and steel manufacturers from the inception of that policy in 1892 until the date when the bounties finally ceasesd.

Steel shipbuilding on a comprehensive scale can be developed if the Government of Canada is prepared to grapple with the matter in a broad and statesmanlike way. The measure of assistance which the country should extend to the shipbuilding industry is a matter for Government decision. The present bounty is entirely ineffective and out of date.

The Alliance Power Co., Ltd., has recently been incorporated at Edmonton, Alta., with a capital of $250,000.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

GAUGES IN MODERN MANUFACTURING PRACTICE—III.

By F. H. Mayoh.

THE accurate measurement of gears is a subject which, while it often gives the designer some uneasiness, nevertheless is easily taken care of by the use of the many styles of gauges provided for this purpose. Some of them are standard as for instance, gear depends largely on the manner of setting up the machine where they are cut it is oftentimes well to resort to testing fixtures or gauges.

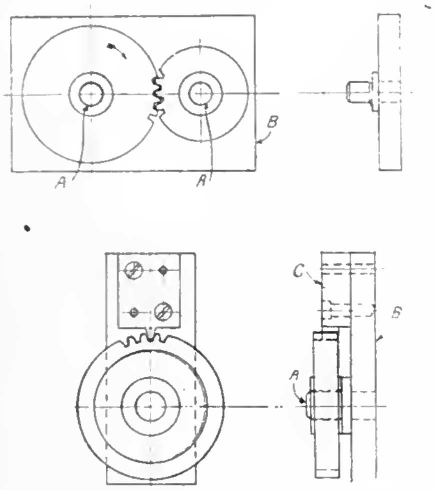


FIG. 13. GEAR TESTING FIXTURES.

A simple fixture for testing the centre distance between two gears is shown in Fig. 13 upper, and is simply two studs A, accurately located in a plate B. The gears are slipped over these studs and tested to see if the pitch diameter of the gear is correct and that the gears

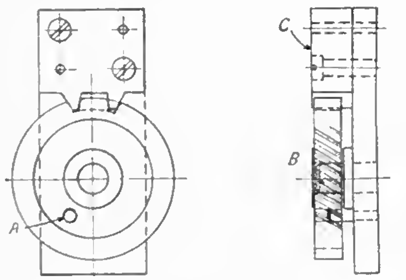


FIG. 14. FIXTURE FOR TESTING SPIRAL GEARS.

will run together in good shape. It is a good plan, however, to have a master gear of each diameter to test all the gears of a set that match with it in order to prove the pitch diameter of each gear, as otherwise the pitch diameter might be small on one gear and large on its mate although not interchangeable with any other gear of that size.

Another gauge for testing the pitch diameter is shown by Fig. 13, lower this consisting of the stud A over which the gear goes and the main plate B,

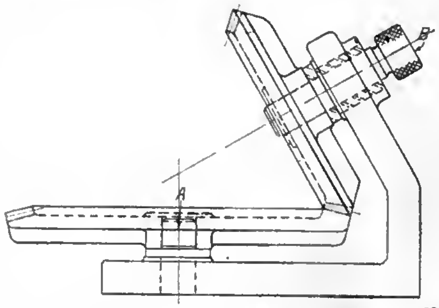


FIG. 15. BEVEL GEAR-TESTING FIXTURE.

with a plate C, which has a gear tooth cut on it to gauge the pitch diameter in the manner shown. Another gauge which is similar in appearance, but which gauges a spiral gear, is shown by Fig. 14. This gauge not only tests the pitch diameter, but also tests the angle of the spiral and its relation to the hole A, the construction being such that the stud B corresponds to the shaft on which this gear runs, the pin A is in a position to correspond to a dowel on the machine and the plate C is a gear tooth to match the angle of spiral on the gear. Similar fixtures to meet various conditions will readily suggest themselves for use on other styles.

Bevel Gear Testing Fixtures

A testing fixture for bevel gears is shown in Fig. 15, where one gear is placed on a stud as shown by A and its mate is held in position, the plug B being run through the bracket and into the hole of the gear thus providing a simple method of testing the working action of these gears.

The Use of Set Blocks

A convenient method of gauging which is often overlooked is the use of set blocks on jigs or fixtures which usually save the operator considerable time when setting up, and avoid much spoiled work, both very desirable features.

Four applications in the use of these set blocks are shown by Fig. 16. The upper left hand view shows a set block of a given thickness placed between a finished pad on a milling fixture and a surface milling cutter to set the cutter in the proper position for taking a cut. The view in the upper right hand corner shows the same set block between a side milling cutter and the finished pad at the side of the fixture which locates the cutter in its proper relation for taking a cut, when by locking the table in place the work being machined can be gang milled with the knowledge that it will come out correct without the necessity of cutting and trying. In the lower left hand corner an example of a set block being tried between two straddle milling cutters is shown, this block be-

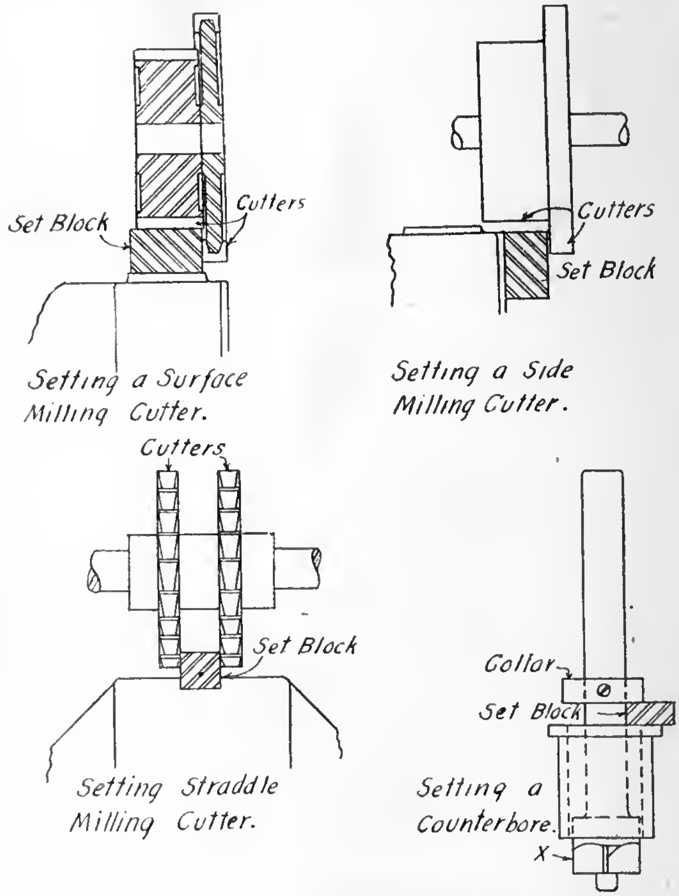


FIG. 16. APPLICATION OF SET BLOCKS.

ing set on the fixture back from where the cutters will work. It is necessary to drop the table of the milling machine with the fixture on it when setting the cutter and try the cutters over the

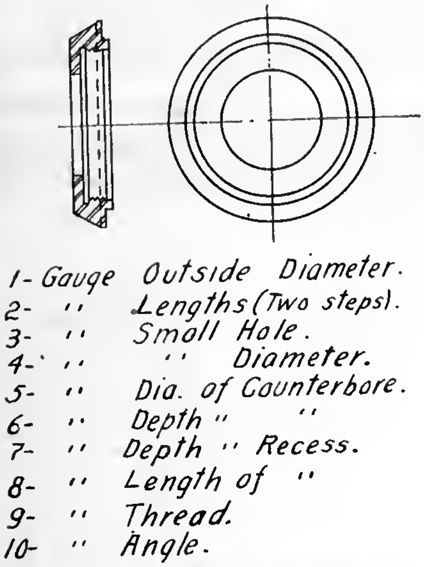


FIG. 17. GAUGING OPERATIONS ON SHRAPNEL SHELL FUSE RING.

block to set them for taking the cut when the table is raised and the machining on the work done.

In the lower right hand corner the method of using a set block for setting the collar on a counterbore in a drill jig is shown the idea being to bring the counterbore down till it touches the work surface (X). A set block of a thickness equal to the depth of the counterbore is then inserted between the collar on the counterbore and the bushing on the drill jig, the collar is set and the work counterbored till the collar comes against the bushing in the jig thus giving the correct depth.

Gauges for Testing Shrapnel Shell Fuse Rings

A complete gauging system for testing a shrapnel shell fuse ring after turning is shown. This ring, Fig. 17, is to be gauged as enumerated below the illustration and this is taken care of by the gauges shown in Fig. 18. The gauge A is for the largest outside diameter, the overall length and length to shoulder. The gauge B is for the small hole, C the diameter of shoulder, D the diameter and depth of counterbore, all of these being of the "go" and "not go" type. The gauge E tests the diameter of recess at bottom of thread for "go" and "not go" by means of the eccentric at the end. The end (X) of the gauge is first placed in the hole and the handle Y is made to turn the rod Z in the eccentric hole until the end V hits in the recess and if the handle Y remains between the two lines, W the recess is the correct diameter. The gauge F is for length of recess by the usual process. Gauge G is for the thread which can be screwed on one end and not on the other. The gauge H tests the angle at the outside and the length of straight by holding the work up to light and sighting the angle for "go" and "not go."

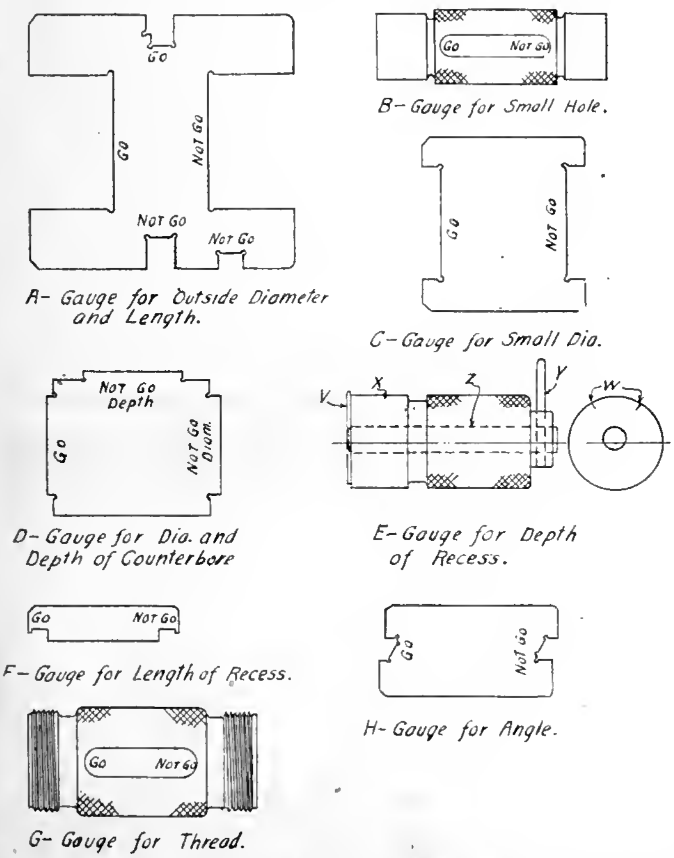


FIG. 18. GAUGES FOR DIMENSIONS IN FIG. 17.

Snap Gauges

Two types of standard snap gauges are shown by Fig. 19, one consisting of drop forged frame and four pins, and the other of drop forged frame and two adjustable pins, thus permitting varying of the limits to suit different conditions.

In addition to the many different types of gauges for the manufacture of machinery, there are also gauges for testing when assembling after the part are thoroughly gauged at the successive machine operations. Some of these are gauges for testing units as they are assembled, and test plugs with indicators for testing the alignment of the machine before sending it out as the finished product. Then there are hardness testing machines, pyrometers or in fact, in the highly standardized machine shop of

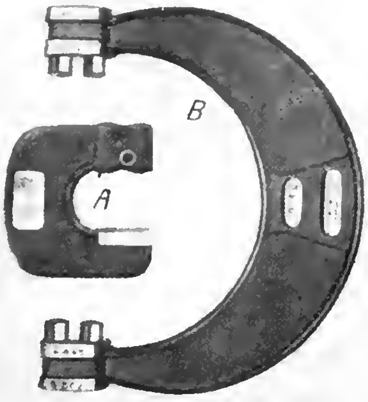


FIG. 19. STANDARD SNAP GAUGES.

multi-production, there are innumerable gauges or testing appliances devised often to suit the most trying conditions and just in so much as these meet their requirements so is interchanging ability secured.

A MILLING FIXTURE

By D. S. Mann

IN fig. 1 is shown a cast iron rod end or terminal which is used on the end of an engine side rod connecting same to rocker arm. The first operation on this piece was milling in sides of the rounded end before reaming the $1\frac{1}{2}$ inch hole thru same. The other operations, drilling, tapping and facing were performed after the milling operation, the piece being located from the previously milled surface.

In Fig. 2 is shown the fixture which is used for holding the piece while milling. The cast iron body is bolted to the miller table, and is provided with a V

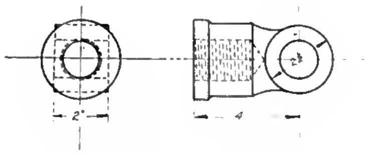


FIG. 1. CAST IRON ROD END.

for centering the rounded end of the piece to be milled. The other end is centered in a tool steel cup which is attached lossely to the end of the large capstan screw operating directly in the body of the fixture and at the same height as the center of the V. The hardened steel cup is provided with a plug which fits loosely into the center of the screw and is held in place by a small counter sunk head cap screw.

The fixture is made high enough so that 12 inch straddle mills may be used and is about 1/4 in. narrower than the faces to be milled, so that it may be readily placed quite accurately without the use of any centering device at the one end, and since all the later operations are located from the milled surfaces the accuracies of these are thereby guaranteed.

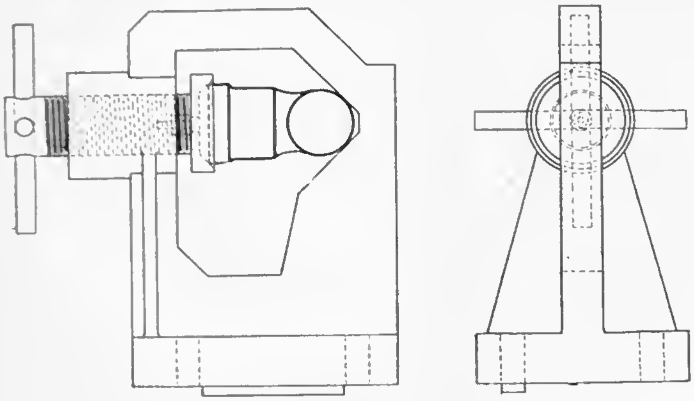


FIG. 2. FIXTURE FOR HOLDING ROD END WHILE MILLING.

This arrangement is very quick acting and there is plenty of room for the hand in putting in and taking out the pieces. The direction of cutting is downward so that all vibration is eliminated. The screw was made long enough to accommodate several lengths of these terminals.

ELIMINATING UNNECESSARY DIMENSIONS FROM BLUE PRINT SKETCHES

By F. H. Mayoh

THE accompanying drawings show a method of eliminating many minor details on drawings, which is of considerable value as a time and trouble saver in putting small jobs through the shop. In many shops special tools have to be made up frequently for new jobs, and, though the tools vary in size, their general design or type remains the same. The preparation of new drawings and tracings for these tools can be largely done away with if the dimensions be left off the original tracing and suitably shaped spaces blackened, which come out white on the blueprint. It is then a simple matter at any time to make up a drawing for a tool with the dimensions varying from previous ones, thus avoiding delay in drawing, tracing and printing.

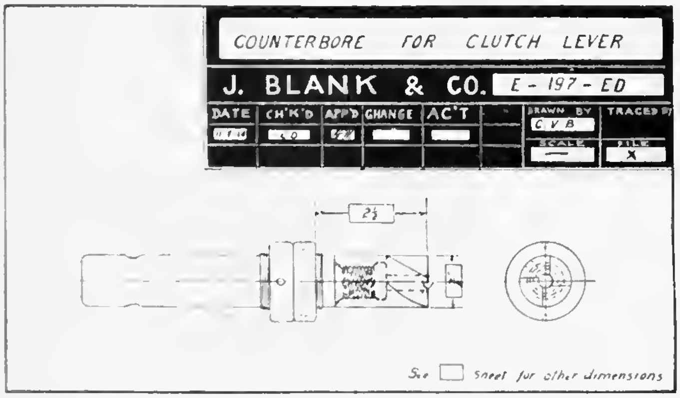


FIG. 1.

Fig. 1 shows a counterbore, the shank of which is made to standard dimensions, and the counterbore itself is interchangeable for different sizes. In making new heads it is only necessary, therefore, to give the two sizes shown, as the drawing for the shank is indicated by the footnote at the bottom of the sketch.

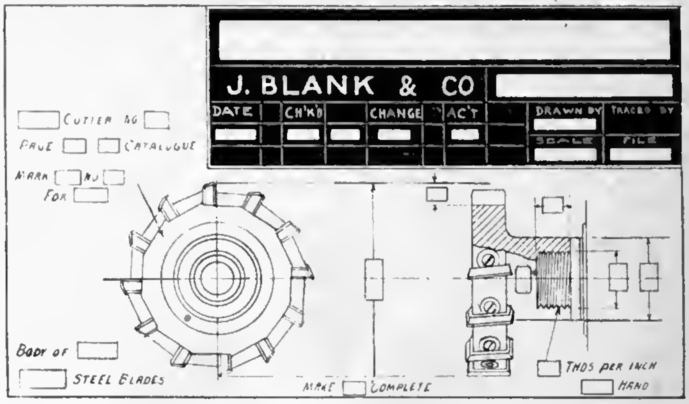


FIG. 2.

Tools of widely varying form are shown in Figs. 2 and 3, the former being a large inserted tooth cutter which screws on to the nose of the milling machine spindle, while the latter shows a gang of metal slitting saws arranged on an arbor. The general purpose of this system of making one tracing for each standard design can be readily comprehended from these examples.

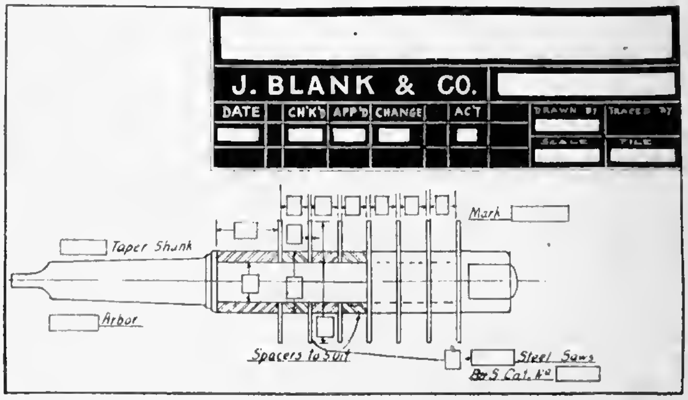


FIG. 3.

STEAMSHIP SERVICE TO WEST INDIES

IN 1913 a contract was concluded between the Dominion Government and the Royal Mail Steam Packet Company providing for a fleet of Mail and Passenger steamers to run fortnightly from St. John and Halifax to the West Indies and Demerara (British Guiana.)

It is pleasing to record that the European War, which has affected overseas trade more or less all over the world, has in no way interfered with the sailings of these steamers which have been maintained without a single break.

It is worthy of note that whereas freight passage rates all over the world have increased enormously, in part owing to the scarcity of tonnage, and in part to the greatly increased cost of working expenses, insurance rates, etc., the rates from Canada to the West Indies, and vice versa, have been maintained at a level that has inflicted no hardship on anyone—the rates being well within range of the enhanced prices producers and others are obtaining for their goods.

It may be truly said of this Canadian service, which owes its inception to Sir George E. Foster, K.C.M.G., the present Minister of Trade and Commerce, that it is a real "Link of Empire," as apart from the close relations it establishes between the Dominion and the 'British" West Indies, it is for the time being, the only regular, "all-red" means of communication between the Mother Country and the West Indies.

The Milton Hersey Co., chemists and engineers of Montreal have opened an office in Winnipeg with B. T. Melsted as manager.

Factors and Influences in the Heat Treatment of Steel-I *

By G. W. Pressell **

The war-created industry of shell-making, which at the moment overshadows in large measure every other form of manufacturing activity in Canada, as elsewhere throughout the world, has incidentally directed special and particular attention not only to the production of the steel of which these missiles of destruction in their fundamental consist, but to the various phases of steel treatment required for general purpose mechanical engineering products.

STEEL is not a simple substance like pure iron, gold or copper, but a complex artificial product. It is composed of groupings of many elements which enter into its make-up like granite rock is built up of the mineral quartz, mica and feld-spar. These elements as they may be called, are only visible with the aid of the microscope.

The term micro-structure has been given to what is thus brought to one's view. Upon etching a highly polished piece of steel this granitic structure is made apparent through the action of the etching medium-acid or other corrosive or abrasive material, which affects the elements variously, causing each to assume a color or structure peculiar to itself.

Mineralogical names have been given to the constituents of iron and steel, and pure iron, or rather carbonless iron, considered as a microscopical constituent, has been called "Ferrite." The ferrite of commercial grades of iron and steel is not pure iron, but rather a solid solution of iron holding small amounts of silicon, phosphorus and other impurities.

Pearlite is a formation in steel made up of definite proportions of iron (ferrite and iron carbide (cementite). The percentage of pearlite in steel is in proportion to the percentage of carbon content. Cementite is chemical combination of iron and earbon approximately 93.3 per cent. of iron and 6.67 per cent. of carbon.

Like most substances, these combinations of elements are decomposed by the action of heat, new ones being formed. Water at 60° Fahr. is a liquid. It is likewise a liquid at 211° Fahr., but at 212° Fahr. it becomes vapor or steam. The elements ferrite and pearlite remain as such up to a temperature of from 749° C. (1380° Fahr.) to 845° C. (1480° Fahr.), depending upon the quantity of each present, when they decompose, forming a new constituent known as "Martensite."

Now this "Martensite" differs materially in its properties from either ferrite or pearlite, in that, if preserved by quenching the steel, it will be found hard and brittle, while pearlite and ferrite are soft and tough. Again, ferrite and pearlite attract the magnet under all conditions, while the new constituent, "Martensite" in its hot condition does not; but in its cold condition it acts the same as ferrite and pearlite.

On account of the close relation existing between the treatment and structure of steel, and the structure and physical properties, it is essential that one realizes the importance of gaining a knowledge of what is called the critical points in steel, in order to lay the foundation for its heat treatment.

Thermal Critical Points of Steel

If one should watch the slow heating of a piece of steel in a furnace, it would be noted that the temperature of the steel gradually increases with the increasing heat of the furnace until a temperature is reached when the steel may become slightly darker or cooler than the furnace. As the heating is continued, the piece will again assume the temperature of the furnace. In the rising heat the darkening of the piece of steel is due to the absorption of the heat to convert ferrite and pearlite into martensite.

If the furnace be permitted to cool slowly, during some point in the process the steel may become brighter or visibly hotter than the furnace, after which it assumes its normal rate of cooling and continues on down to atmospheric temperatures. This rise in temperature in cooling indicates a giving off of heat, which is caused by the conversion of the martensite back to ferrite and pearlite.

A transformation of the constituents composing the steel accompanies these thermal changes—as for example on heating, the decomposition of ferrite and pearlite to form martensite, as mentioned above, or vice versa, the decomposition of the martensite into its constituents ferrite and pearlite, as the case may be, during cooling.

The temperatures or points occurring during the heating and cooling when these changes take place are called the critical points of steel. To distinguish between these two points, or ranges of points, those occurring on the heating are termed "Decalescence" and those on the cooling "Recalescence" points. When the various critical points occurring in steel are considered collectively, the range of temperature that they cover is called the critical range. The critical range may include one, two, or three points. The meaning of the expressions "Critical Range on Heating" and "Critical Range on Cooling" is obvious. These ranges have a value which is of great importance in practical work.

The decalescent and corresponding recalescent points do not occur at exactly the same temperature, the decalescent points generally occurring from some 25° C. (77° Fahr.) to 50° C. (122° Fahr.) higher than the recalescent. It does not follow, however, that these two points are not the opposite phases of the same phenomenon. The fact that the critical point on cooling lags behind the point on heating and vice versa is evidently a case of hysteresis, so often observed in physical phenomena, implying a resistance of certain bodies to undergo a transformation, when theoretically the transformation is due. The slower the process of heating and cooling, the nearer will the two points approach each other, so that with infinitely slow cooling and heating they would undoubtedly occur at exactly the same temperature.

Mechanical Treatment of Steel

The principal purpose of working steel is to shape it into the desired form. Its structure and physical properties are dependent on the care in working and the heats used. The mechanical working aside from machining is classed under two heads, namely: "Hot" and "Cold" working.

The finest grain size obtainable is undoubtedly that existing just as the steel has passed through the critical range on a rising heat. Hence, starting out with steel just below its solidification or undisturbed cooling, the grain size increases until the cooling has passed through the critical range, and the grain size at this stage will be the resultant size at the cold temperature. Taking the same piece of steel, for instance having a coarse structure, on heating there will be no change in grain size until the critical range is reached; there the coarse crystals break up and at the upper critical point form the finest possible structure. Continued heating.

*From a paper read before the Canadian Railway Club, Montreal.
**Metallurgist, E. F. Houghton & Co., Philadelphia, Pa.

however, above this point will again coarsen the grain.

As we have stated, undisturbed cooling is a condition necessary for crystalline growth, a coarse crystalline structure can, however, be partly prevented or broken up by vigorous hammering. If this hammering ceases above the critical range, crystallization again sets in and the structure is the coarser the higher the temperature above the critical point at which the work stops. The finishing temperature in working, then, should be for the best results at or just above the critical range.

The question arises, why not continue working the steel until it is cold? This would be a detriment, inasmuch as the grain structure is formed in the critical range and "cold working" causes distortions and strains to set up in the grain which result in decreased ductility and even brittleness. This effect is more pronounced the lower the temperature below the critical point at which the steel is worked. Mechanical working provides a means to shape steel to form by forging, refines the grain size and tends to increase the density of steel decidedly more than the steel possessed originally from the mills where rolled. High-grade steels are hammered at the mills into bars and rolled to proper size.

Annealing

Inasmuch as the annealing process has an important bearing upon the physical properties, the mechanical treatment and the subsequent effect on the heat treatment of steel after machining, it is essential that the basic principles of this operation be thoroughly understood. The purpose of annealing steel is: 1st—To increase its softness and ductility and facilitate subsequent machining operations; 2nd—To remove existing coarseness of grain and secure a desirable combination of strength, elasticity and ductility for the resisting of strains; and 3rd—To relieve internal stresses, such as are induced by forging, rolling or by non-uniform contraction in cooling. These changes of physical properties are due to the changes of structure caused by the heating operation, which operation consists essentially of three parts: 1st—Heating the steel to the desired temperature; 2nd—Holding at the temperature until the steel is thoroughly heated; 3rd—Cooling.

Since all crystallization is obliterated in heating steel through the critical range, it is necessary then to heat the steel through this range as the first step in the annealing operation. Heating to a temperature below the critical range would induce no structural change whatever, but should you heat considerably above the range you would again bring about a form of crystallization, which is detrimental. The following ranges of temperatures are recommended by the Committee on Heat Treatment of the American Society of Testing Materials. They also state that for steels of a manganese content greater than .75 per cent. slightly lower temperatures are advisable:

Range of Carbon Content.	Range of Annealing Temperature.
Less than 0.12%	875° to 925° C. (1587° to 1697° F.)
.12 to .29%	840° to 870° C. (1544° to 1598° F.)
.30 to 49%	815° to 840° C. (1499° to 1544° F.)
.50 to 1.00%	790° to 815° C. (1454° to 1499° F.)

The time at which the steel should be held at an annealing heat is governed largely by the size of the piece. In order to bring the interior of large objects to an effective annealing temperature the outside may often be heated advantageously somewhat above the desired temperature. Therefore, a range of temperatures is given for each range of carbon content. The upper limit of this range applies to larger objects and also to the lower range of carbon content given.

The rate of cooling should be regulated to suit the carbon content of the steel and the physical properties desired. The higher the carbon the slower the cooling. Also the slower the cooling the softer and more ductile the steel and lower will be the elastic limit and tensile strength. Steel containing more than .50 per cent. carbon should cool slowly either in the furnace, lime or clay until it becomes black in color, when it may be removed. In case great softness and ductility is desired all steels should be subjected to slow cooling.

It is desired, of course, to have some definite range of temperatures to control the elasticity and ductility of the steel. For very high elastic limit and tensile strength heat to from 500° to 650° C. (932° to 1202° Fahr.). In this case the ductility will be low. Some steels, such as watch springs and shaftings, are annealed at 350° C. (662° Fahr.). Very little commercial annealing is done below 500° C. (932° Fahr.). For intermediate tensile strength, elastic limit and ductility best suited for the majority of cases, anneal at from 600° to 650° C. (1112° to 1202° Fahr.). For the greatest ductility with good strength and elastic limit, anneal at from 725° to 750° C. (1337° to 1382° Fahr.).

Internal stresses caused by forging or rolling are partially eliminated by heating steel to a temperature of from 538° to 649° C. (1000° to 1200° Fahr.) and allowing to cool slowly. The control of the annealing operation by definite heats and methods unquestionably prepares steel to respond better to hardening and treating, reduces the strains and distortions which are inevitable, and paves the way for a most uniform finished product. It is advisable to anneal high carbon steel by packing with finely ground charcoal in iron boxes and insert the fire end of the pyrometer inside of the boxes to assure that the pieces are heated to the proper annealing temperature and to obtain a check on the heat in the pot.

Tensile Strength

In referring to the tensile strength of steel, one usually implies those properties of the material known as the yield point, which is commercially called the elastic limit; the ultimate strength; the elongation, and the reduction of area.

A "stress" is an internal force that resists the change in shape and size of any material by an applied force, and when the applied forces have reached their final values, the internal stresses hold them in equilibrium. The simplest case is that of a rope, at each end of which a man pulls with a force, say, 25 pounds; then in every section of the rope there exists a stress of 25 pounds. Stresses are measured by the same units as those used for the applied forces, and generally in pounds.

A "bar" is a prismatic body having the same size throughout its length. If a plane is passed normal to the bar, its intersection with the prism is called the "cross section" or the "section" of the bar, and the area of this cross section is called the "section area."

"A unit stress" is the stress on the unit of the section area, and this is usually expressed in pounds per square inch. For example:—Let a bar 2 inches square be subjected to a pull of 4,000 pounds, the resisting stress is 4,000 pounds and the unit stress is 4,000 pounds divided by the area of the bar, which is 4 inches, or 1,000 pounds per square inch. When external forces act upon the ends of a bar, in a direction away from its ends, they are called "tensile forces." When they act towards the end they are called "compressive forces." A pull is a tensile force and a push is a compressive force, and these two cases are frequently called "tension" and "compression." The resisting stresses receive similar designations. A tensile stress is that which resists tensile force.

The terms "axial forces" and "axial stresses" are used to include both tension and compression acting upon a bar along the axis of the bar. The first effect of axial load is to change the length of the bar upon which it acts. The deformation of a bar which occurs in tension is called the "elongation," and that which occurs in compression is called "shortening."

NEW PROCESS DEVELOPMENTS

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

THE MANUFACTURE OF LEATHER BELTING—II.*

By F. H. Small.**

IN our previous article on the manufacture of leather belting, it was stated, that if the belt maker always knew what qualities he wanted in the leather from which he made his belting, he could go far toward obtaining these by proper choice and application of tanning material. We enumerate these qualities as our experience has shown them:

Belting Qualities Desired

First—We need good driving surface, sufficient friction between belt and pulley to eliminate slippage as completely as may be, and to enable the belt to carry its load under minimum tension, thus avoiding useless waste of power at the bearings.

Second—Lateral stiffness, coupled with pliability, the stiffness to keep the belt from twisting and waving and to prevent its curling at the edges when shifted; the pliability to enable it to hug the pulley, wrapping itself round and so securing large arc of contact, and to enable it to alter its shape with the minimum of internal resistance as it travels round the pulley.

Third—Good tensile strength that it may carry its load without breaking.

Fourth—Little stretch, but considerable elasticity; the former so that it will need to be shortened as seldom as may be, i.e., will do its work uninterruptedly; the latter so that it may easily take up and let go its load as it travels round the pulley.

Fifth—Firmness or stability, much the same as lateral stiffness, so that the leather springs little when cut, holds its shape, remains straight and runs true on the pulleys.

Sixth—Resistance to external conditions, such as heat, moisture, chemicals, etc.; that it may do its work in any place, at any time, and enduringly.

Seventh—Low initial cost.

It is apparent that no leather can have all these qualities in the highest degree, for some of them are incompatible. Sole leather would do admirably as far as lateral stiffness, little stretch, and firmness are concerned, but would fail lamentably to satisfy the requirements of pliability, tensile strength, elasticity, etc. The best result we can achieve is bound to be somewhat of a compromise. We must aim to get the largest measure possible of the most desirable qualities in our leather, with the least necessary sacrifice of others. There is where the beltmaker who tans his own leather has a marked advantage in that he may bend all his efforts to so adjusting his tannage as to secure the best possible compromise. Quality belting demands then—first, suitable hides; second, suitable tannage.

*Presented at the annual meeting of the Providence Association of Mechanical Engineers (A.S.M.E. Affiliation), September 22, 1915.

**Chemist, The Graton & Knight Mfg. Co., Worcester, Mass.

Belting Leather Preparation

We now have the leather and may proceed to prepare it for making into belting. Of the hides which we have tanned only 50 per cent. may legitimately be cut up into belting and less than 40 per cent. will go into first quality belting. First, we reject the bellies, cropping or cutting them off at the flank; this loses us 25 per cent. of the hide. Next we cut off the shoulder at a point 4 ft. 4 in. from the tail, or, if the hide be exceptionally small, at a less distance; this loses us 25 per cent. more, leaving us for cutting into belting a "bend" which constitutes less than 50 per cent. of the original hide.

This bend has now to be curried, i.e., given a supplementary grease-tannage: set out—to give a smooth flat piece of leather—and then stretched. The stretching is done on frames in which the wet leather may be clamped and subjected to so much tension as desired, the leather being allowed to dry under tension on the frames so that an additional stretch resultant upon the natural shrinkage of the leather in drying is imparted to the leather. Before being stretched the bend is usually cut into a centre and two side pieces, inasmuch as the centre portion being more close fibred will not stretch as much as the side pieces and by being divided as above the leather can be stretched more in accordance with its capacity. After stretching, the leather is rolled and glassed to improve its appearance, and is then ready to go to the stock room.

When the leather is received in the stock room, it is sorted according to weight or thickness—which in this connection are practically synonymous terms—into extra heavy, heavy, medium and light, and then packed down for future use. The sides are packed in square piles, alternate layers at right angles, to keep the stock flat and straight and allow of a circulation of air through the pile, thus aiding and hastening the seasoning process. This seasoning is an often neglected, but most desirable operation, for the use of well-seasoned leather is as important in the manufacture of belting as the use of well-seasoned lumber is in building. Belts made from well-seasoned stock stretch less and more uniformly, retain their elasticity and wear longer than belts from green stock.

Producing the Belt

From the stock room the leather goes to the belt shop, where its manufacture into belt takes place. The first step in this process is to straighten one edge of the leather. Next it is cut into strips of various widths by passing between a rapidly-revolving circular knife and a guide, the strips being graded for width and roughly for quality as they come from the knife, and then stored in racks. From these racks the leather goes to the sorters, by whom it is most carefully graded, both for thickness and quality, and on their expertness depends the maintenance of the standard set for each brand of belt. Accurate judgment of quality depends on wide experience in handling leather and a good all-round knowledge of the specific characteristics of the leather in different parts of the hide, for it is a fact that no two square inches of hide are precisely alike.

Quality, however, is very elusive of definition when one tries to imprison it in the confines of a specification, and the buyer is fully as likely to be well served if he states his needs and trusts to the honesty of an established and reputable house as if he attempts to be his own judge. The author has in mind a large railroad buying belting according to a specification which called for the leather to be cut from strictly first quality belting butts, and they were getting it, necks and all. Inasmuch as a belt is no better than the poorest strip in it, similar to the chain that is no stronger than its weakest link, it may be imagined how well they were being served. Later when the author's company had an opportunity to supply this railroad with some belting, we were rather chagrined to have it rejected by the railroad inspector. Some rolls of stock belt of a grade distinctly inferior to that first offered were then submitted and accepted by the inspector with a cheerful response: "That's what we want; why didn't you give us that at first?" For

(Continued on page 377)

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

CHISEL COMPOSITION AND TREATMENT

IN a paper read recently before the Institution of Mechanical Engineers, the author, Henry Fowler, chief mechanical engineer, Midland Railway, Derby, England, said that very considerable attention has been given to the composition and treatment of tool-steel used in machine tools, but the three implements of the hand worker—the file, the chisel, and the hammer—have been comparatively neglected. While aware of the work recently done in testing the former of these, and knowing that there is little need of improvement with the last-named, Mr. Fowler believes that the chisel has not received the systematic attention its importance deserves. A close examination of the new and used chisels in the shop, over which he had control, confirmed that view, and the result was an effort to induce the Alloys Research Committee of the Institution to take up the matter. For various reasons this was not successful, so the matter has been dealt with individually.

The material usually employed for chisels is not bought to specification, but a well-known and tried brand purchased. In the chief mechanical engineer's department of the Midland Railway, after considerable experiment, it was decided to order chisel steel to the following specifications:—Carbon 0.75 per cent. to 0.85 per cent., the other constituents being normal. This gives a complete analysis as follows:—

	Per cent.
Carbon	0.75-0.85
Manganese	0.30
Silicon	0.10
Sulphur	0.025
Phosphorus	0.025

It is perhaps interesting to note that the analysis of a chisel which had given excellent service was as follows, its heat treatment was, however, unknown:—

	Per cent.
Carbon	0.75
Manganese	0.38
Silicon	0.16
Sulphur	0.028
Phosphorus	0.026

At the same time that chisel steel was standardized, the form of the chisels themselves was revised, and a standard chart of these as used in the locomotive shops drawn up. Figs. 1 to 10 show the most important forms of these, which are made to stock orders in the smithy and forwarded to the heat-treatment room, where the hardening and tempering is carried out on batches of fifty. A standard system of treatment is employed there which to a very large extent does away with the personal element. Since the chemical composition is more or less constant, the chief variant is the section which causes the temperatures to be varied slightly.

The chisels are carefully heated in a gas-fired furnace to a temperature of from 730°-740° C. (1346°-1364° F.), according to section. In practice the chisel, Fig. 1, is heated to 730° C.; chisel, Fig. 2, to 735° C. (1355° F.); and a 1-inch half round chisel to 740° C., because of their varying increasing thickness of section at the points. Upon attaining this steady temperature, the chisels are quenched to a depth of 3/8 inch to 1/2 inch from the point in water, and then the whole chisel immersed and cooled off in a tank containing linseed oil. This oil-tank is cooled by being immersed in a cold-water tank through which water is constantly circulated.

After this treatment, the chisels have a dead hard point and a tough or sorbitic shaft. They are then tempered or the point "let down." This is done by immersing them in another oil-bath which has been raised to about 215° C. (419° F.). The first result is, of course, to drop the temperature of the oil, which is gradually raised to its initial point. On approaching this temperature, the chisels are taken out about every 2° C. rise and tested with a file, and at a point between 215° C. and 220° C. (428° F.), when it is found that the desired temper has been reached, the chisels are removed, cleaned in sawdust, and allowed to cool in an iron tray.

A question which naturally will be asked is whether comparative tests of these chisels with those bought and treated by the old rule-of-thumb methods have been made. The author knows of no method of carrying out such tests mechanically, other than that of hardness by the Brinell or Scleroscope method; again, any ordinary test depends largely upon the dexterity of the operator. The opinion of foremen and others using the chisels as to the advantages of the standard treatment set out gives convincing evidence of improvement

The author is aware that questions may be raised as to why the chisels have not been normalized at about 900° C. (1652° F.), after forging and before hardening. This matter had attention when the question was first dealt with, but at that time there were no facilities for carrying out the work. These have since been provided in connection with certain other work, but although various chisels have been normalized in the manner mentioned, no advantage has been found in carrying this out.

Discussion

Sir Robert Hadfield, in opening the discussion, told about an old-world chisel from Ceylon, dating from the early years of the Christian era, which he had recently examined. The shaft portion of this chisel, he said, was nearly pure iron. How had its point been hardened? He suggested some sort of cementation process had been followed, for example, the heating of the wrought iron chisel in a charcoal fire and its subsequent quenching in water.

It was interesting to note that Mr. Fowler by his paper virtually advocated and defended the use of old-fashioned carbon steel as the best for chisel-making purposes. He himself would like to suggest that we might get improved practice by using an alloy steel, such as one containing 0.55 to 0.66 per cent. of carbon and 1.0 per cent. of chromium. Longer life might be one result of using such a steel. A committee, he thought, might with great advantage be appointed to inquire into the whole matter.

An armour-piercing projectile was to some extent analogous to a chisel—a "one-blow" chisel, as Captain Sankey reminded him, and, for such a projectile, alloy steel was, of course, essential. Considering that it had a striking energy of 40.000 foot-tons and could pierce a 15 in. plate in the space of one-thousandth of a second, we saw it was indeed a very rapid "one-blow" chisel.

Mr. Fowler stated that his chisels were first quenched in water and then in oil. Could he say what was the temperature of the point when the chisel was dipped into the oil? Was the chisel quite chilled off in the water or was some heat left in it to run up to the point between the two immersions? He was interested to notice that Mr. Fowler had found no advantage in normalizing his chisel steel after forging and before hardening it. This was to be expected, for the crucible steel of which the chisel stock was composed was very carefully made, and had, as delivered, great uniformity in its composition, so that normalizing coulld hardly be expected to improve its uniformity. The paper, he thought, was of great practical value. He would send copies of it

round to all his foremen, who. he knew would benefit by reading it.

Daniel Adamson desired to know if the author could trace any connection between the scleroscope or Brinell hardness number and the duty or efficiency of the chisel. The paper could only be regarded as a guide to the treatment of one particular steel. Could Mr. Fowler give any information which would enable members to extend the treatment to steels of other compositions?

W. H. Allen, while remarking that the paper was very difficult to discuss, intimated that some observations which he himself had made on the form and treatment of chisels were to be presented to the Institution shortly.

L. Pendred inquired whether all the chisels referred to in the paper were for hand purposes or whether some were for use in pneumatic tools. A chisel suitably hardened for hand use was not necessarily equally suitable for employment in a pneumatic tool.

Druitt Halpin suggested as a scientific means of testing chisels the use of a standard file-cutting machine.

A. W. Marshall said that the paper spearated the smith from the hardener and temperer. The heating of the steel to forge it had to be taken into account in planning the heat treatment required to harden and temper the chisel. and, in his opinion, the man who forged the chisel ought also to finish it ready for the fitter. How did the author deal with chisels which came back for reforging? Had he also standardized a re-dressing process?

T. T. Heaton asked what special steps were taken to test the quality of each batch of chisel steel and to see whether it was of the standard quality.

J. E. Brown asked how the cutting angles at the points of the chisels had been arrived at, and whether these angles were varied to suit the exact use of the chisel.

G. T. Gillespie also inquired regarding this matter of the cutting angles, and further asked what was meant by "metal tool," the title given to Fig. 10 of the paper.

A. B. Jackson asked how broken-off chisels were treated.

Mr. Gentry asked if, in quenching off in water, the chisel was moved up and down slightly so as to avoid creating a sharp line of demarcation between that section of the chisel which was dead hard and that portion which was soft. He would suggest that the secret of the success of Mr. Fowler's chisels lay in the fact that they were "let down" twice in two separate oil baths. He would like to know how the temperature of the second oil bath, 410 deg. Fah., compared with the temperature corresponding to a tempering color of dark straw with patches of purple.

John Dewranee said that the duty of a chisel was practically identical with that of a machine cutting tool. Had any one present ever used high-speed steel for chisels? He had heard of very mild steel hardened at the point by means of prussiate of potash being used for chisels, particularly pneumatic tool chisels.

W. S. Lockhart asked how the chisels

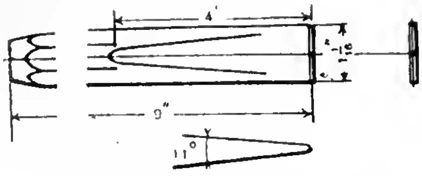


FIG. 1. HEAVY BRASS WORK.

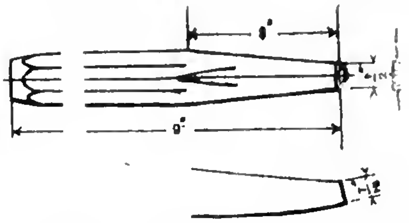


FIG. 6. DIAMOND POINT FOR JAGGING, ETC.

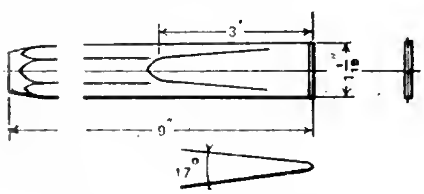


FIG. 2. HEAVY IRON AND STEEL CASTINGS.

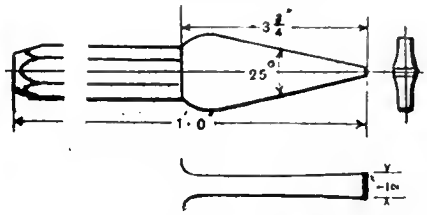


FIG. 7. LONG CROSS COT.

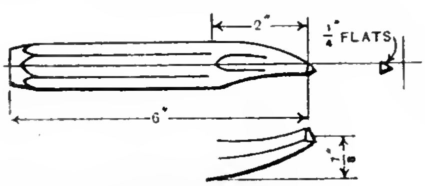


FIG. 3. CYLINDER REPAIRS (RIGHT HAND).

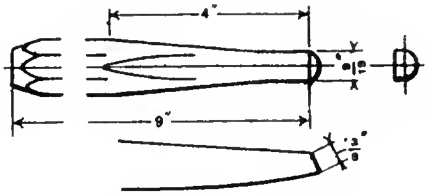


FIG. 8. ROUND NOSE.

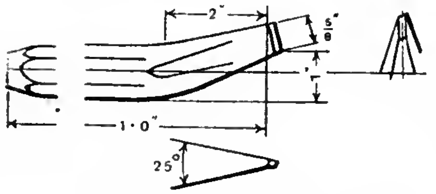


FIG. 4. SIDE TOOL (RIGHT HAND).

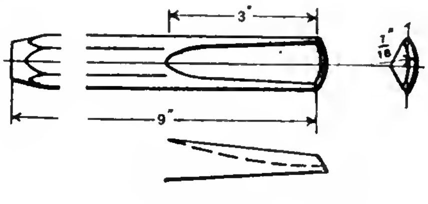


FIG. 9. GOUGE TOOL.

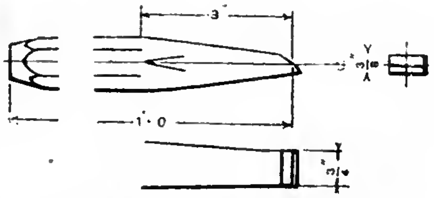


FIG. 5. SQUARE NOSE.

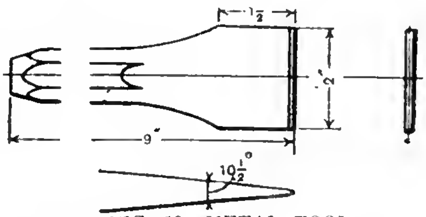


FIG. 10. METAL TOOL.

were served out. Were they given to the men as forgings for each individual to grind for himself? Would the steel recommended also be suitable for miners' drills? Fifty or sixty years ago in Cornwall it was the custom for the smiths when hardening picks and drills to powder some wolfram ore on their anvils and to throw it into the fire on top of the tool point. Wolfram was then not only valueless but actually an encumbrance. To-day it was used at Sheffield in much the same way as that of the Cornish smiths of half a century ago.

G. Watson supported the formation of a small committee to deal with the standardization of shape and treatment of small hand tools, including chisels. He suggested the possibility of using with advantage composite chisels consisting of expensive steel tips welded to less expensive steel shafts.

Author's Reply

Mr. Fowler, replying to the discussion, said he had from the first wanted the council to appoint a small committee to deal with the subject of his paper. If it were yet possible to do so, he thought it also ought to include consideration of pneumatic tools and of fet-

tlers' setts. He had not tried alloy steel for chisels, and from the discussion he judged that there were none present who had. The length of time the chisel was kept in the water depended upon the section of the chisel, but undoubtedly some heat was left in it, which before the immersion in oil ran back to the point. He could give no information leading to the correct method of correlating the scleroscope hardness number with the efficiency of the chisel. He looked forward with pleasure to Mr. Allen's contribution on the same subject.

All the chisels referred to in the paper, were for hand use. He would like to try the file machine test suggested by Mr. Halpin. The drawing down of the chisels was carried out by the smith, the subsequent heat treatment being performed by others. Repairs and reforgings were, it is understood, carried out by the staff of the heat treatment shop. He stated that the chisel steel was analyzed regularly for its carbon and occasionally for its other constituents to see, for example, that the sulphur content was not too high. The "metal tool" shown in Fig. 10 was intended for use on white metal.

The workmen were not supposed to sharpen their own tools, these being supplied sharpened from the store and when blunt or broken were supposed to be returned there. They had not a single grindstone in the whole of their erecting shop. Replying to Mr. Gentry, he said that the operator did move the tool back and forth in the water as and for the purpose suggested. He could not give the information asked for regarding the comparison of temperature and tempering color. His department, he informed Mr. Dewrance, used large milling cutters of mild steel, with case-hardened cutting edges, but so far they had not adopted this plan for chisels.

TRIALS OF THE MACHINE SHOP FOREMAN

By J. H. R.

THE selection of suitable mechanics is very often a serious, and sometimes expensive problem. If the foreman of each department had the opportunity of examining a man before he is chosen for the performance of certain work, much unnecessary trouble might be avoided.

In many large establishments it is the custom to have an employment agent, whose duty it is to hire all the help that may be required throughout the plant. When this official is a highly experienced man, the possibility of erroneous selection is reduced to the minimum; but unfortunately, in many instances, this office is held by a man with no practical experience, and who is therefore unfitted to judge on the qualifications of a man for certain positions. Many men might answer the questions put to them to the entire satisfaction of this official, but when passed on to the works foreman, it is sometimes found that the new hand is not only unfitted for the position for which he has been employed, but may know little or nothing of the elementary knowledge required for the successful operation of the work of the shop.

A Boring Mill Operation

Some years ago, in a large engineering works in Eastern Ontario, a man was engaged for the operation of vertical boring mill. The workman was told to report to the foreman on the following morning. When the man was taken by the foreman to the machine he was supposed to operate (a 5-foot vertical boring mill) he stood aghast, and remarked that he had never run such a large machine. In the hope of breaking him in on a smaller tool, he was taken to a 30 inch mill, but this also seemed out of his province. Doubt took possession of the foreman at this stage, and he requested the man to look about and point out the kind of mill he had been accustomed to operate. The suspicions of the foreman were somewhat when the "boring mill hand" pointed out a small radial drill. As this particular "mill" had an operator, it was the duty of the foreman to tell the new hand that he could not place him at the present time.

A Budding Lathe Hand

On another occasion, in a different factory, a young man, who was supposed to have served several years at the machine trade, was employed as a lathe hand. The first job given him was a number of small castings that required a stem turned to a certain diameter. The completion of this job was apparently quite satisfactory, and he was then given a batch of 36 shafts to turn; these shafts required journals turned on the ends, and the centre portion—a length of approximately 30 inches—to be turned to given dimensions.

While the roughing process was being performed on the end journals the foreman, owing to illness, was forced to leave the works. Before leaving however, he came to the writer and requested him to keep an eye on the new man, and see that he was given other work when these shafts were finished. Sometime later the new hand commenced the roughing out of the body, or long central portion of the shafts. From the opposite side of the shop I occasionally observed the young man. He had turned about a foot of the shaft when he stopped the lathe, came over to me and asked if I had ever found that lathe "cut into the centre". Thinking he referred to the lathe centre "cutting in", due to the expansion of the shaft, I told him to ease off the tail centre.

A New Size

The expression of his face told me that this was not the trouble, and further questioning brought the remark from him that "the size was getting smaller as the cut advanced along the shaft". I then told him to adjust the tail stock so as the lathe would cut parallel. As he walked slowly away I could see that my last suggestion had fallen on "deaf ears" and, thinking he might attempt to fix things by prying the end of the lathe over, I followed him back to his machine and set him going along the proper course. The shaft he had been working on however, had been started about 1-64 above the finished size, and where he had stopped, a distance of 15 inches, the size was 1-32 below the finished dimension, and this particular shaft was therefore spoiled.

When he had completed the batch, on the following day, he asked me over to examine them. After going over several and finding the variation within reasonable limits, I asked him if they were all as close as those I had tested. He replied that they were all within a "seventy-second". Suppressing a smile I said if they were as close as that they would pass. Sufficient to say when the foreman returned the man was released.

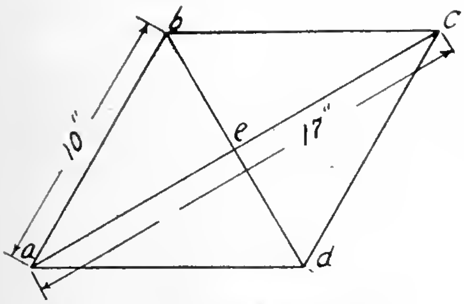
It is therefore quite evident, that as far as possible, where the foreman is responsible for the production of work, he should be allowed to have some say in the class of men who are placed under his charge.

Picric Acid.—Benzene, a redistillation product from benzol, is used in the manufacture of carbolic acid or phenol; this in turn is the basis of picric acid, which latter is the base of most of the high explosives used at the present time in the European conflict. When phenol (carbolic acid) is treated with nitric acid, a nitrate called tri-nitro-phenol is formed. Its only use is as an explosive. It is not only an explosive of itself, but more particularly is used as an ingredient of special explosive mixtures. Most of the new so-called shell-filler explosives are either picric acid or mixtures of picric acid salts called picrates. Among these are ecrasite (Austrian), lyddite (English), melinite (French), shimose (Japanese), etc. The exact compositions of these are secrets carefully guarded by the different governments.

Series of Practical Questions and Answers for Mechanics

Every care is being taken to include only pertinent practical questions, and give same direct, reliable answers. Catch questions will be avoided. Arithmetic, consisting of simple addition, subtraction, multiplication and division will be found a useful companion study.

Question—A square 10 inches on a side, is forced into a parallelogram, the long diagonal of which measures 17 inches; what is the area of the parallelogram, and the percentage of reduction?



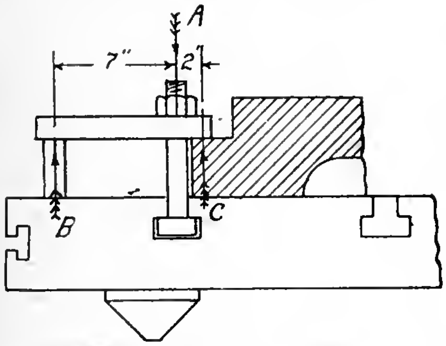
SQUARE AND PARALLELOGRAM QUESTION.

Answer—If the length of the long diagonal, a c equals 17 inches the length of the short diagonal or line, b d, can be found from the equation b e= $\sqrt{[(b\ c)^2—(c\ e)^2]}$ = $(10^2—8.5)^2)$= 5.267 inches.

Then as the several triangles are of similar shape and size, the area will equal the length of one of the diagonals multiplied by one-half the length of the other, or 17 $\times$ 5.267=89.539 sq. inches. The percentage of reduction from the original area of the square would be 100—89.54 = 10.46 or approximately 10½ per cent.

* * *

Question.—When clamping work on the lathe face plate or planer table, what is the best position for the clamping bolt?



CLAMPING WORK ON TABLE.

Answer.—The object of the clamps being to hold the work securely, it is obvious that the greater pressure should come upon the work, therefore the bolt should be placed as close to the work as possible; to illustrate, if the nut on the bolt is screwed down so that a pressure of 1000 lbs. is acting on the clamp at A, the reaction on the two supports B and C will be inversely proportional to their distance from the center of the bolt. As the distance between the two supports is 9 inches the reaction C will be 7-9 of 1000 = 778 lbs. and the reaction at B will be 2-9 of 1000=222 lbs. However, as circumstances will not always permit of this being done, the location of the clamping apparatus must always be governed by existing conditions.

Question.—With a feed of 3-64 inch on a 6 inch shell what will be the cutting speed in feet per minute if the shell is rough turned in 20 minutes; length of shell 17 inches?

Answer.—The length of the complete cut in feet will be $\frac{6 \times 3.1416 \times 64 \times 17}{12 \times 3}$ =569 feet. Speed in cutting feet per minute equals 569÷20=28.5 feet.

* * *

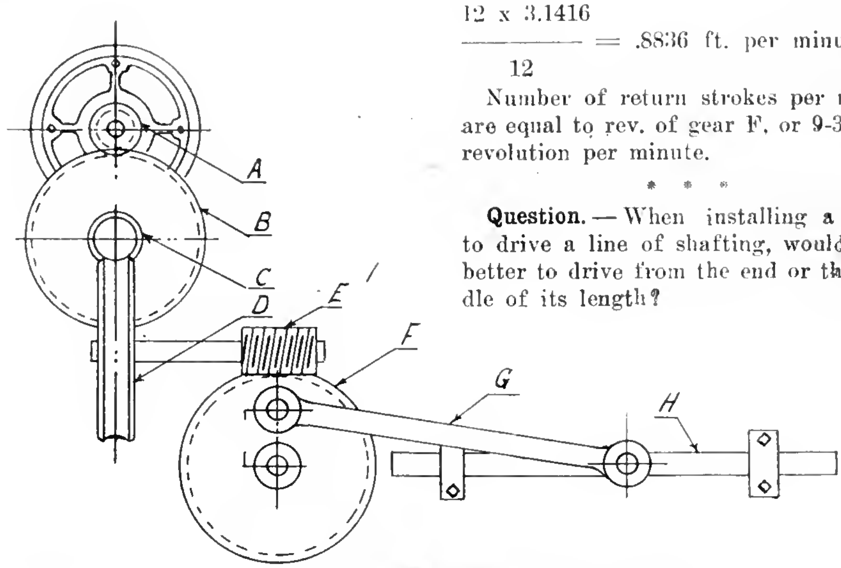
Question.—A motor operates a horizontal slide bar, through a link and train of gears, as shown in the sketch; how can we find the maximum linear speed and the number of return strokes per minute of the slide bar H, motor operating at 1800 rev. per minute?

Pinion A has 30 teeth; gear B 80 teeth; C, single thread worm, worm gear D, 60 teeth; E, double thread worm, and F a worm gear of 80 teeth.

Answer. — The speed of the driving shaft multiplied by the number of teeth in the driving gears, will equal the speed of the driven shaft multiplied by the number of teeth in the driven gears; thus, if X equals the speed of the gear F, then 1800 x 30 x 1 x 2 =X x 80 x 60 x 80 or X = $\frac{1800 \times 30 \times 1 \times 2}{80 \times 60 \times 80} = \frac{9}{32}$ rev. per minute, or 1 revolution in 3 5-9 minutes.

The maximum speed of bar H, will be when link G is in the position shown. With the mechanism in this position the speed of bar will approximate $\frac{9}{32} \times \frac{12 \times 3.1416}{12}$ = .8836 ft. per minute.

Number of return strokes per minute are equal to rev. of gear F, or 9-32 of a revolution per minute.



ILLUSTRATING SPEED OF SLIDE BAR.

* * *

Question. — When installing a motor to drive a line of shafting, would it be better to drive from the end or the middle of its length?

Answer.—Under general conditions it is advisable to have the main driving pulley placed upon the shaft as near the centre of its length as possible so as to move evenly distribute the strain throughout the shaft. When the drive is from one end the torsion on the shaft is sometimes very great, where a heavy load is carried. However local conditions must be carefully considered as it is sometimes impossible to follow a hard and fast rule, but in all cases better results are obtained if the heavy loads are kept as near the source of power as possible.

* * *

Question.—What is the proper clearance for milling cutter teeth, and the distance the tooth rest should be below the centre to obtain the desired angle, when grinding with a cup wheel, and also a disc wheel?

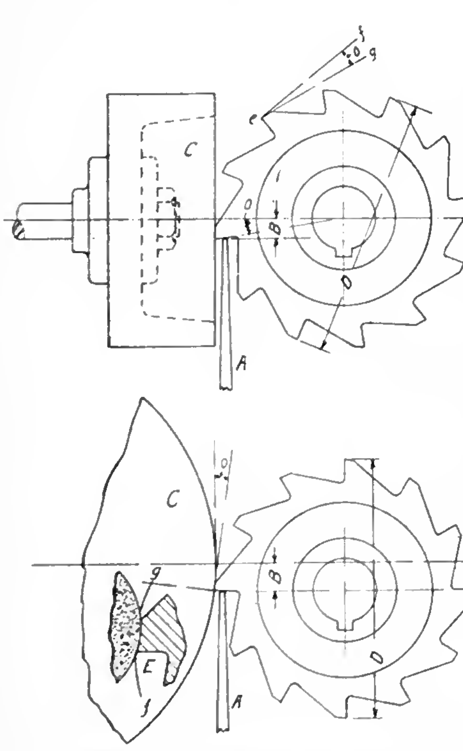
Answer.—The usual peripheral angle on the teeth of milling cutter is from 5 to 7 degrees, as shown in the sketch, the angle o representing the clearance. As the cutters are all of different diameters, it is obvious that the distance B, of the finger rest A below the centre line, must vary

for each size of cutter. To find this distance, when using a cup wheel, multiply the diameter of the cutter by .044 for 5 degree clearance angle, and by .06 for a 7 degree clearance.

When using a disc wheel we are governed by the diameter of the grinding wheel C, and the distance B, in which the work centre is below the centre of grinding wheel spindle. The distance B is found as in the case of the cup method, but by calculating with the wheel diameter. For example, to find the distance B when using a 6 inch wheel; 6 x .044 = .264 in., for 5 degree clearance, and for 7 degrees use the multiple .062. However, if a very small wheel is used, it may be necessary to add a little to the result obtained. This can be more clearly shown by referring to the exaggerated section E.

Question.—How can we determine the point of cross on crossed belts when the pulleys are of different sizes?

Answer.—The crossing point X will always lie nearer to the smaller pulley. The distance x b. will be to the center distance a b, as the diameter of the small pulley is to the sum of the pulley diameters. For example, a pulley 24



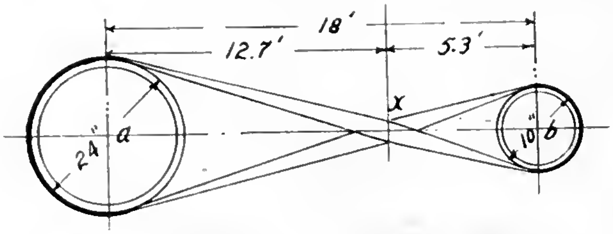
OBTAINING CLEARANCE ANGLE WITH CUP AND DISC WHEELS.

inches in diameter is to be connected by a crossed belt to a 10 inch pulley, shafts being 18 feet apart: where will the point x fall?

(x b) : (a b) : : d : D + d or

(x b) : 18 : : 10 : 24 + 10 then

$$(x\ b) = \frac{18 \times 10}{24 + 10} = \frac{180}{34} = 5.3 \text{ ft.}$$



POINT OF INTERSECTION OF CROSSED BELTS.

FOUNDRYMEN'S CONVENTION AT CLEVELAND

TO permit the foundrymen who will attend the annual meetings of the American Foundrymen's Association and the American Institute of Metals, which will be held in Cleveland during the week of September 11, to indulge in plant visitations to a greater extent than was possible at previous conventions, where two or three sessions were held daily, it has been decided by the program committee of this organization to have only one technical session per day, which will continue from 9.30 a.m. until the papers and discussions for that session have been disposed of, the hour of adjournment having been tentatively fixed at 1 p.m. This arrangement, it is believed, will meet with the hearty approval of all of the members of these societies, and it will enable them also to devote more time to the inspection of the exhibits of foundry supplies and equipment and machine tools, which will be held concurrently at the Cleveland Coliseum. The conventions of these two societies will open one day earlier than formerly, the final session to be held on Friday. The annual meeting of the American Foundrymen's Association, therefore, will continue for a period of five days, from Monday, Sept. 11 to Friday, Sept. 15, inclusive. The meetings of both the American Foundrymen's Association and the American Institute of Metals will be held at the Hotel Statler, which also will be the headquarters of these two societies, but headquarters for the exhibitors will be at the Hollenden Hotel.

The meetings of the American Foundrymen's Association and the American Institute of Metals will be opened on Monday morning with a joint session of both societies, and the program will include the address of welcome and response; the annual addresses of the presidents of the American Foundrymen's Association and the American Institute of Metals and the reports of the secretaries of these two organizations. In addition, the representatives of the American Foundrymen's Association on the "Joint Conference Board on the Training of Apprentices" will present a report and the report of the committee on "Safety and Sanitation" also will be heard.

A joint technical session also will be held on Tuesday, the program being limited to three papers, which will constitute symposiums on the following subjects: "Waste Foundry Sand; Its Reclamation and Disposal," which will be discussed in various papers that will treat the topic from different viewpoints: "Results of the Closer Co-operation of the Engineer With the Foundry," as relating to the manufacture of aluminum and brass castings, cast iron, malleable cast iron and cast steel and "Proper Gating of Molds," for the manufacture of aluminum and brass castings, cast iron, malleable iron and steel castings.

The annual business meeting of the American Foundrymen's Association will be held on Wednesday morning, Sept. 13, when officers will be elected and reports of the executive committee and the auditors will be heard. Also a report will be made by the special committee of five on the conferences which it held during the year that led up to the conduct of the exhibit under the auspices of the American Foundrymen's Association and the American Institute of Metals.

Three simultaneous sessions will be held on Thursday morning for the discussion, respectively, of gray iron, cast steel and malleable iron, while on Friday morning malleable iron and steel sessions will conclude the business of the convention. The program, as outlined, promises to be the best in the history of the American Foundrymen's Association, since the topics to be discussed are practical and relate to problems daily confronting the foundryman.

C. E. Hoyt, Lewis Institute, Chicago, exhibition manager, already has received a large number of applications for space and the indications are that the Cleveland coliseum, which affords a floor area of 60,000 square feet will be crowded to capacity. No assignments of space have yet been made, nor has a floor plan been prepared, although this will be done within the next few weeks, when requirements of the various exhibitors approximately will be known.

A meeting of Cleveland foundrymen will be held for the purpose of appointing committees for the entertainment of the visitors, to serve as guides in plant visitation and for the reception and entertainment of the ladies who will attend. It is probable that the annual banquet will be held at the Statler hotel on Thursday evening, Sept. 14. Negotiations now are being conducted to secure several speakers of national reputation to deliver addresses at the banquet.

CONTEMPORARY WAR ARTICLES

Embracing Information and Data Drawn from a Variety of Sources Relative to and Arising from the Prosecution of this Many-Sided European War

INDUSTRIAL DEVELOPMENT — I.

AT a meeting of the Institution of Civil Engineers, held recently, an address on "Industrial Development" was given by Harold Cox. He said that when peace was declared probably three million soldiers would return from the war seeking work, many thousands of munition workers would be discharged, and an enormous number of separation allowances would be discontinued. These changes must have a tremendous effect upon our whole social life—so serious that many people who had thought deeply about the problem even feared the possibility of industrial revolution after the war.

At present we had made no provision for these difficulties that were certain to come. There was a good deal of vague talk, but vague talk did not set industry in motion. They had to plan in advance, and he ventured to think that this was one of the problems for which the Institution of Civil Engineers was eminently adapted to deal. Engineers by their occupation were necessarily engaged in the ordinary course of business in planning great enterprises. Most of them, owing to the very wise system of their training, had experience of manual work and of work side by side with men who were now merely wage-earners. There must be some kind of collective effort, which did not necessarily mean Government action.

SECTION OF LARGE SHELL HYDRAULIC PRESS SHOP IN NEW BRITISH PROJECTILE-MAKING FACTORY.

External Aspect of Industrial Problem

There were two aspects of the problem —the domestic and the external. The extension of external trade was one of the principal objects we had to keep in view, not only from the economic, but also from the political point of view. He thought the greatest danger experienced from German trade was due to the manner in which the Germans had used their trade connections to build up political agencies in remote parts of the British Empire and in neutral countries. There was constant repetition of vague demands that the Government should do something in regard to external trade. Our recent experience of Government action did not encourage us to look for very much more from what the Government might do in the future.

It might be said that the Government did something for external trade. It maintained a consular service. He had studied a great many consular reports, and his impression was that a very large number of our consuls were gentlemen who had not been successful in the diplomatic service. In addition, we had consuls of foreign nationality, and sometimes they had been our trade rivals and our political rivals. Besides publishing statistics generally two years out of date, our consular reports, with a repetition which became wearisome, persisted in repeating the parrot cry that Britishers did not know their own business and ought to learn from the Germans.

He remembered one such report, which stated that Germans had captured the trade because they gave long credit, and three or four years later he came across another consular report from the same place which remarked that one did not hear quite so much about German trade as one used to; in fact, the only Germans one saw were a few seedy individuals trying to collect bad debts. These reports were a sheer waste of public money. He ventured to think no consular service controlled by the Government would ever be of practical use.

A Business Men's Consular Service

The question arose, why should not business men organize their own consular service? Some years ago Sir John Wolfe Barry started the idea that it would be possible for the various engineering societies in this country to organize a Standards Committee to establish common standards, to which all manufacturers should work. He got together a committee on which were represented that body, the Institution of Mechanical Engineers, the Institution of Naval Architects, the Iron and Steel Institute and the Institution of Electrical Engineers. He need not point out the enormous economy in manufacture which resulted from having standards.

The work done by the committee in the fifteen years it had been in operation was immense. They had established standards for hundreds of different articles, and these standards were reconsidered from time to time to meet new conditions. They were recognized throughout the world, and by their very existence had given a foothold to British trade in foreign countries. The committee had representatives of the Admiralty and War Office. It received grants in aid of its expenditure from his Majesty's Government, from Colonial Governments, municipal bodies, railway companies, gas companies and private manufacturers.

If a voluntary organization, started entirely by individual enterprise, could thus build up a system of standards which was of world-wide fame, was it not possible to conceive a larger organization representing practically all the trades of the country which should deal with the great problem of developing trade abroad—an organization for collecting trade information from agents employed abroad, systematizing that information and distributing it among the manufacturers primarily concerned?

Kingston, Ont.—The Street Railway Co. will instal two motor generators.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

TEN ROLL BAR STRAIGHTENER

A MACHINE which straightens all sizes of round bars from 1 in. to $2\frac{1}{2}$ in. diameter is illustrated in the accompanying photograph which shows a special ten roll straightener made by Brightman Manufacturing Co., Columbus, O. This machine is designed for handling rough bars, and bars which are straightened in this machine receive a high finish as well as being straightened in one pass through the machine.

The straightener consists of a bed with upright pedestal bearings at each end, which support a revolving frame having hollow journals. This frame carries the straightening mechanism, consisting of ten rolls with concave surfaces, the rolls being supported by bearing blocks having a swivel and screw adjustment. The roll supports are arranged on the revolving frame so as to project alternately from opposite sides, excepting at the receiving end of the frame, where two rolls are directly opposite. At each end of the straightener, tracks are provided, which are traversed by a gripping device which prevents the bar from revolving while it is being straightened.

The contact of the concave rolls on the bar produces varying speeds according to the amount of concave surfaces put on the rolls, at the same time a certain amount of slipping which occurs between the rolls and the bar imparts a very fine finish to the work. Rolls are adjusted at an angle to the shaft according to the diameter, each roll having a segmental line of contact with the surface of the shaft. This prevents gouging out or breaking of edges of flaws or cracks which may exist in the surface of the material and allows them to be smoothed over.

The capacity of this machine is from 20 to 40 feet per min., according to size of bar and speed of operation.

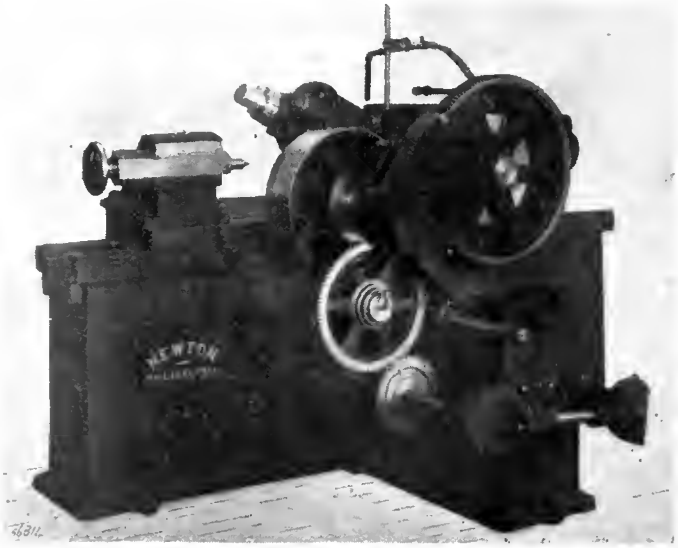


FIG. 2. REAR VIEW OF WORM MILLER SHOWING BELT PULLEY AND DRIVING GEARS.

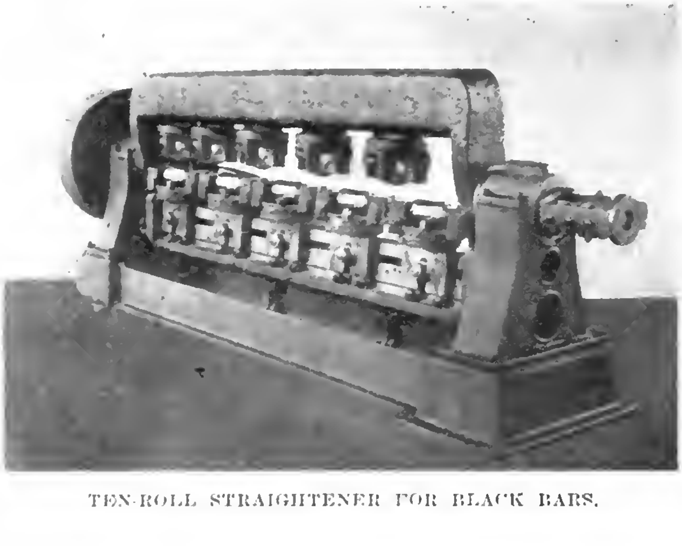
WORM MILLING MACHINE

THE accompanying photographs illustrate a worm milling machine which has been redesigned by the Newton Machine Tool Works, Inc., Philadelphia, so as to incorporate numerous improvements and alterations which have been suggested during the fifteen years since the original machine was built, the present machine, as offered to machinery users, having been in operation for the past year.

The operating side of the machine is shown in Fig. 1, the various adjustments being controlled by means of levers grouped within convenient reach of the operator. The driving gear is arranged on the rear side (see Fig. 2).

The work is supported by headstock and tailstock mounted on a table, which slides in ways on the top of bed. The cutter head, which also carries the driving gear, is gibbed to machined ways on the top of bed (see Fig. 2). All movements of the work and cutter are obtained from driving pulley, the drive to the cutter being through reduction gears to the large spur gear mounted on a shaft, at the inner end of which bevel gears transmit the motion to a shaft parallel with the cutter spindle. A taper bearing is provided at each end of the cutter spindle, which is provided with a hardened integral helical gear, which is driven by hardened gearing from the parallel shaft referred to.

The angularity of the cutter spindle is adjusted by worm gear, which provides a maximum range of 40 degrees on either side of the horizontal, spacing collars being used to locate the cutter accurately with the axis of the head. From



TEN-ROLL STRAIGHTENER FOR BLACK BARS.

FIG. 1. OPERATING SIDE OF WORM MILLING MACHINE SHOWING CUTTER AND FEED-CHANGE BOX

the driving pulley, power is also transmitted to the headstock through the train of gears and shafting around the lower part of the bed to a feed box on the front of the machine, which provides nine changes of speed to the main feed shaft.

Quick return of the work is controlled by the long lever at the right of the feed box, while the short lever immediately above the box throws the feed clutch in or out.

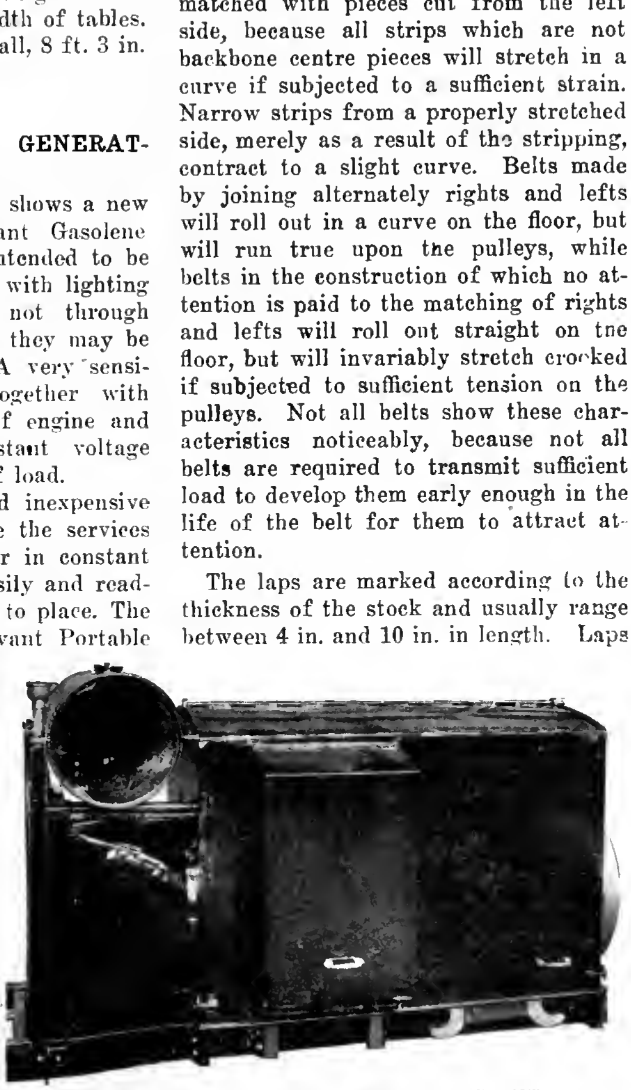
In operating, the turned worm blanks are forced on a mandrel, one end of which is inserted in the taper draw chuck in the hollow spindle of the headstock; and after being secured, is not again released until the worm is complete. All adjustments to and divisions for successive leads are controlled by a tooth clutch on the indexing gear, which provides leads from 1 to 6 inclusive and pitches from 1/4 in. to 9 3/4 in. All of the required gear combinations for right and left-hand threads are contained in the box which forms the headstock. Power is also transmitted through this box to the gears which are connected to the feed screw for travelling the table past the cutter.

Maximum distance, end of spindle to tailstock centre, 24 in.; height from table to centre, 8 1/4 in.; width of tables, 14 1/2 in.; size of base over all, 8 ft. 3 in. x 4 ft. 6 in.

PORTABLE GASOLENE GENERATING SETS

THE following illustration shows a new adaption of the Sturtevant Gasolene Generating Set which is intended to be used in direct connections with lighting and power circuits and not through storage batteries, although they may be so arranged if desired. A very sensitive governor control, together with other fineness in design of engine and generator, insure a constant voltage through wide variations of load.

These sets are easy and inexpensive to operate, do not require the services of an experienced engineer in constant attendance, and can be easily and readily transported from place to place. The unit consists of a Sturtevant Portable Electric Generating Set made up of a Sturtevant Direct Current Electric Generator direct connected to a Sturtevant Gasoline engine. A switchboard and gasoline tank is also included. A special type of disc fan is mounted on an extension of the generator shaft and arranged to blow air through a cellular type radiator. All of this apparatus is mounted upon two channel irons and the engine generator and switchboard are covered by a sheet metal housing, similar to an automobile hood.



PORTABLE GASOLENE GENERATING SET.

The engine is of the four cylinder, water cooled, vertical type with either four or six cylinders according to the size of the unit. Three sizes of these sets are built, 5 kw., 10 kw., and 15 kw. capacity capable of lighting 200,400 and 600 20 candle power tungsten lamps. Both engine and generator are capable of operating under an overload of 25 per cent. for two hours.

THE MANUFACTURE OF LEATHER BELTING

(Continued from page 369.)

our own ultimate good we have been trying to educate that railroad on this subject of quality in belting.

Matching the Strips

Returning to the process of manufacture, after the strips have been sorted, they then go to the fitters to be matched and have the laps marked. Pieces cut from the right side of the hide are matched with pieces cut from the left side, because all strips which are not backbone centre pieces will stretch in a curve if subjected to a sufficient strain. Narrow strips from a properly stretched side, merely as a result of the stripping, contract to a slight curve. Belts made by joining alternately rights and lefts will roll out in a curve on the floor, but will run true upon the pulleys, while belts in the construction of which no attention is paid to the matching of rights and lefts will roll out straight on the floor, but will invariably stretch crooked if subjected to sufficient tension on the pulleys. Not all belts show these characteristics noticeably, because not all belts are required to transmit sufficient load to develop them early enough in the life of the belt for them to attract attention.

The laps are marked according to the thickness of the stock and usually range between 4 in. and 10 in. in length. Laps must be longer on the shoulder end of the piece because hides become thinner, taper off faster, near the shoulder than near the rump, and longer laps are needed, therefore, to maintain a uniform thickness of belt. Shoulder ends are joined to shoulder ends and butt to butt, because the length of the laps match better, the thickness is more uniform, the stock is similar in quality and the component parts will, therefore, wear and stretch more uniformly. The laps are next searfed and prepared for cementing.

Cementing the Laps

The usual cement employed to stick the laps has for its basis animal glue. Each manufacturer is likely to have his own pet formula calling for certain additions to the glue solution and particular methods of compounding, but they all look much alike. By this it is not meant to disparage the cement, for a cement that will hold as long as the leather will wear is a necessary component of a quality belt. About twelve years ago saw the beginnings of the now indispensable waterproof cement. Laps stuck with this are absolutely unaffected by water, either cold or hot. Whatever cement is used the process of sticking is the same in its essentials. The surfaces of the leather to be joined are coated with the cement, put together in their final position, placed between the plates of an hydraulic press and subjected to heavy pressure. From the presses the belt goes to the inspector and then to stock.

The above description applies more particularly to single belting, but the processes are much the same if double or three-ply belting is to be made. A liberal quantity of stock which has been scarfed and the flesh side of which has been cleaned up with a scraper to remove grease, loose flesh, etc. (this being the side which is cemented), is placed upon the fitter's bench. He matches these together on a smooth surface against wooden blocks, which are his standard of thickness,the pieces being matched to secure as uniform thickness as possible, and so that the laps of one ply come about half-way between the laps of the opposite ply.

Adaptation to Operating Conditions

I wish to emphasize the fact that the idea that a belt is a belt and one need merely cut off a piece of the requisite length and put it on the pulleys is no longer tenable. Proper mechanical conditions and adaptation of belt to drive are just as essential to economy of operation as is the suiting of a motor to the work it has to do.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.
H. C. FOGARTY.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. APRIL 27, 1916 No. 17

ORGANIZATION A FACTOR IN THE FUTURE OF THE ENGINEERING INDUSTRY

EVERY week seems to bring additional and more conclusive evidence of the intention of the Entente Allies to set their house in order commercially with special reference to German methods of the past and suspected efforts of the future.

The International Parliamentary Economic Conference of the Entente Allies which opens at Paris to-day, is an event which serves notice on the world of commerce that the union of trust and sympathy between our allies and ourselves which is such an outstanding characteristic of the present struggle, will not be allowed to fade away after the termination of active hostilities, but will be kept alive by such international co-operation in the realms of legislation and commerce that never again will it be possible for barbarian races to masquerade under a veneer of civilization.

As an active participant in the war and prospective participant in the world's future trade, Canada is more than concerned in the questions to be discussed at the conference, among others being such vitally interesting subjects as measures of precaution against the invasion of the markets of the Allies by German products upon the conclusion of peace; measures for repairing the damages of war; agreements in regard to the international transportation of merchandise; the creation of an international patent bureau; internationalization of the law-governing corporations, etc., etc.

Although these measures are at the moment being merely discussed with a view to bringing about preliminary agreements in regard to the various proposals, the solidarity of the Allies is made very evident by the fact that such proposals have been made. The ultimate object of all such measures is, of course, to insure the supremacy of law and order, and while this will be largely insured by restraining ruthless ambition on the part of the enemy, it will also be accomplished by corresponding encouragement to and advancement by our Allies and ourselves.

But, however much may be accomplished by such meetings, it must be constantly borne in mind that such events are merely beacons pointing the way for our future progress and that without sound judgment and consistent effort on our own part, the benefits which ultimately accrue will be anything but proportionate. In this connection particular reference might be made to the activity at present being shown by the engineering industry in England, on Tuesday, March 24, the Council for the Organization of British Engineering Industry held a conference at Manchester to discuss the conditions of the engineering trade after the war. A special committee of the Organization stated, as a result of their inquiries, that British engineers must organize without delay to meet the conditions which will follow the ending of the war. . . "Germany and Austria have gained the enmity of half the civilized world and the distrust of the remainder. All that is needed to enable us to reap the harvest already enriched by their blunders, is an organization that embodies a broader and loftier view of the responsibilities, opportunities and powers of our engineering industry.

That such a movement is representative of British manufacturers as a body was shown by the speakers present, who included T. C. Elder, of the British Electrical and Allied Manufacturers' Association; Dr. S. Z. de Ferranti, past-president of the Institute of Electrical Engineers; G. Goodbehere, chairman of the Engineering Section of the Chamber of Commerce, and several others.

The apathy of the British Cabinet to the repeated demand for the establishment of a Ministry of Commerce has forced the industry to exert itself to do all that is humanly possible to help itself, which it would fail to do if it did not organize a general association powerful enough to exert collective influence, in all foreign markets, to offer authoritative counsel to the Government, to stimulate scientific research, and to bring it into closer communication with scientific progress.

In view of the somewhat parallel state of affairs existing in Britain and Canada with regard to munitions work, the remark of one speaker that. . "the question was what was to be done in the 3,000 works where munitions were being made, some of which had already been warned that the demand for munitions in their cases was going to diminish, whether the war ended or not," is of especial significance to Canadian makers at the present moment, and in view of the hopes which are being built on the prospects of export trade from this country, the time is more than ripe for organized effort by the engineering firms of this country, not as a branch or department of an organization devoted to manufacturers generally, but a specialized body composed of engineering specialists whose every effort would be devoted to maintaining the engineering industry of this country at its present high level against all comers.

INDUSTRIAL NOTABILITIES

HENRY HAGUE VAUGHAN, 3rd Vice-President and Director, Dominion Bridge Co., is of English birth and parentage, having been born at Forest Hill, England, Dec. 28, 1868, son of Walter Henry and Sarah (Jones) Vaughan.

On completing his education at King's College, London, he entered the employ of Nasmith, Wilson & Co., Patricroft, subsequently being engaged at the Gorton Shops of the Manchester, Sheffield & Lincolnshire Railway, and the Nine Elm Works of the London & South Western Railway.

HENRY HAGUE VAUGHAN

Mr. Vaughan came to the United States in 1891, occupying successive positions with the Great Northern Railway, Q. & C. Co. and Railroad Supply Co., Chicago, till 1902, when he was appointed assistant superintendent of Motive Power, Lake Shore & Michigan Southern Railway, Cleveland, Ohio, 1902-1904; Superintendent, Motive Power, Eastern Lines, C.P.R., 1904-1905; Assistant to Vice-President, C.P.R., 1905-1915; resigned to accept Presidency, Montreal Ammunition Co.

He is also a member of Institute of Mechanical Engineers; Canadian Society Civil Engineers (Councillor, 1910); American Society Mechanical Engineers (Vice-President 1910-1912); President, American Railway Master Mechanics' Association, 1908.

Mr. Vaughan married Helen Polk, daughter of D. F. Polk, St. Paul, Minn., and resides at 18 Weredale Park, Montreal, Que.

His clubs are: St. James', Mount Royal, Forest and Stream, Royal Montreal Golf, Montreal Racket, Engineers (Montreal, President, 1911); Engineers (New York); Canadian Railway (President, 1909); Garrison (Quebec).

—Photo, Courtesy International Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh		$18 70
Lake Superior, charcoal, Chicago		19 75
Michigan Charcoal iron		28 00
Ferro nickel pig iron (Soo)		25 00
	Montreal.	**Toronto.**
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Victoria, No. 1	$27 00	$25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	3.00
Steel bars, f.o.b., Toronto	3.00
Steel bars, 2 in. and larger, base	5.25
Common bar iron, f.o.b., Montreal	3.00
Steel bars, f.o.b., Montreal	3.00
Twisted reinforcing bars	3.25
Bessemer rails, heavy, at mill	2.50
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	3.00
Small shapes	3.25
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	3.10
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$33 00	$31 50
Electrolytic copper	32 50	31 25
Castings, copper	31 00	31 00
Tin	50 00	56 00
Spelter	23 00	22 00
Lead	10 00	10 50
Antimony	47 00	48 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in.	$3 75	$4 00
Heads	4 00	4 25
Tank plates, 3-16 in.	4 05	4 50

WROUGHT IRON PIPE

Prices in effect April 3, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 00	5 31
1/2 in.	3 83	5 91
3/4 in.	4 60	7 42
1 in.	6 80	10 97
1 1/4 in.	9 20	14 84
1 1/2 in.	11 00	17 74
2 in.	14 80	23 87
2 1/2 in.	23 40	37 73
3 in.	30 60	49 34
3 1/2 in.	36 80	59 34
4 in.	43 60	70 31

Lapweld

2 in.	16 28	25 35
2 1/2 in.	23 99	38 32
3 in.	31 37	50 11
3 1/2 in.	37 72	60 26
4 in.	44 69	71 40
4 1/2 in.	54 61	87 00
5 in.	63 64	101 40
6 in.	82 56	131 50
7 in.	114 20	174 90
8 in. x 25 lbs. per ft.	120 00	183 80
8 in. x 25 lbs. per ft.	138 20	211 70
9 in.	165 60	253 60
10 in. x 32 lbs. per ft.	153 60	235 20
10 in. x 40 lbs. per ft.	197 80	302 80

Ontario list—All points from Kingston and west to, but not including Port Arthur.

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	2 94	5 25
1/2 in.	3 74	5 82
3/4 in.	4 49	7 30
1 in.	6 63	10 80
1 1/4 in.	8 97	14 61
1 1/2 in.	10 73	17 46
2 in.	14 43	23 50
2 1/2 in.	22 82	37 15
3 in.	29 84	48 58
3 1/2 in.	35 88	58 42
4 in.	42 51	69 22

Lapweld

2 in.	15 91	24 98
2 1/2 in.	23 40	37 73
3 in.	30 60	49 34
3 1/2 in.	36 80	59 34
4 in.	43 60	70 31
4 1/2 in.	53 34	85 73
5 in.	62 16	99 90
6 in.	80 64	129 60
7 in.	111 90	172 60
8 in. x 25 lbs. per ft.	117 50	181 30
8 in. x 28 lbs. per ft.	135 40	208 80
9 in.	162 20	250 10
10 in x 32 lbs. per ft.	150 40	232 00
10 in. x 40 lbs. per ft.	193 60	298 70

Eastern list applying Eastern Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 25	$18 25
Copper, crucible	21 75	21 50
Copper, heavy	22 00	22 00
Copper wire	22 00	22 00
No. 1 machine compos'n.	17 00	17 00
No. 1 compos'n turnings.	15 00	15 00
New brass clippings	16 25	15 00
No. 1 brass turnings	12 00	12 00
Heavy melting steel	9 00	9 30
Boiler plate	11 75	14 00
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	10 50	9 00
Stove plate	10 50	9 50
No. 1 machin'y cast iron	14 75	14 00
Heavy lead	7 25	7 25
Tea lead	6 25	6 25
Scrap zinc	15 25	15 75
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	55
Stove bolts	65
Plate washers	30
Machine bolts, 3/8 and less	47 1/2
Machine bolts, 7-16 and over	37 1/2
Blank bolts	37 1/2
Bolt ends	37 1/2
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in.	$3.75 per lb. off
Nuts hex., over 1 in.	$2.00 per lb. off
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	42 1/2
Boiler rivets, base, 3/4-in. and larger	$4.35
Structural rivets, as above	4.10
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS.

	Per cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	60
Finished nuts over 1 in.	55
Semi-Fin. Nuts up to 1 in.	60
Semi-Fin. Nuts over 1 in.	55
Studs	45

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	68 00
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES.

Standard steel wire nails, base	3 45	3 65
Cut nails	3 20	3 20
Miscellaneous wire nails		65%
Pressed spikes, 5/8 diam., 100 lbs.		$3 75

MISCELLANEOUS

Solder, guaranteed	0.31½
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.18
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.77
Linseed oil, raw, single bbls.	0.97
Linseed oil, boiled, single bbls.	1.00
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Lead wool, per lb.	0.13
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	50
Standard drills over 1½ in.	15
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	10
Bit stock	50
Ratchet drills	15
Machine bits for wood	10
S.S. drills for wood	20
Wood boring brace drills	35 and 5
Electricians	20
Sockets	50
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks	list plus 5
Bridge reamers	55
Centre reamers	5
Chucking reamers	5
Hand reamers	5

High speed drills and reamer prices withdrawn.

COLD ROLLED SHAFTING

At mill	list plus 30%
At warehouse	list plus 40%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 5 per cent.; B and C, 25 per cent.; cast iron, 50 and 10; standard bushings, 60 per cent; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 80	$4 00
Sheets, black, No. 10	4 35	4 50
Canada plates, dull, 52 sheets	4 00	4 25
Canada Plates, all bright	6 30	6 00
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	6 75	6 75
Premier, No. 28, U.S.	7 25	7 00
Premier, 10¾ ozfl.	7 50	7 25

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.35
3/8 in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
5/8 in.	6.35
¾ in.	6.15
7/8 in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B.B.

1/8 in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
3/8 in.	6.35
7-16 in.	6.35
½ in.	6.35
5/8 in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	65-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	....
1¼ in.	19 55	....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	12 50
2¼ in.	26 60	13 30
2½ in.	29 00	15 95
3 in.	38 70	17 50
3¼ in.	....	21 00
3½ in.	44 00	23 00
4 in.	49 50	28 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, 3/8 in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, 3/8 in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble, 40 & 10%	
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.15¼
Peerless	.15¼
Grand	.14¼
Superior	.14¼
X L C R	.13¼
Atlas	.13¼
X Empire	.12¼
Ideal	.12¼
X press	.11¼
COLORED.	
Lion	.09½
Standard	.08¾
No. 1	.08¾
Popular	.07¾
Keen	.06¾

WOOL PACKING.

Arrow	
Axle	Prices on
Anvil	application
Anchor	

WASHED WIPERS.

Select White	
Mixed colored	Prices on
Dark Colored	application

This list subject to trade discount for quantity.

COPPER SHEETS

	Montreal	Toronto
Bars. ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 m.	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.35 to .37
Tin	.60 to .64
Zinc	.25 to .27

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy	.35
Copper sulphate	.30
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., April 24, 1916.—The situation throughout the industrial fields is quiet, following the recent holiday period; but, activity is gradually assuming larger proportions. The manufacture of shells in Britain and France is constantly being increased, and the pressure in this country will no doubt be correspondingly decreased. The production of the raw and semi-finished material will, however, still continue to maintain its present position, as the requirements of foreign countries will still call for large supplies from this side of the Atlantic for a long time to come.

To offset the possibility of labor troubles, many manufacturers have voluntarily advanced the wages of their workmen; the increases in some cases being in the form of bonuses, payable at the termination.

Navigation is gradually taking on its summer activity, and much of the congestion of railway transportation will in consequence be relieved.

Steel

The general steel situation is unchanged, the undertone being one of comparative quiet. Buyers are not very anxious to place far future orders at present prices, and this is resulting in a reduction of placed orders. The volume of business on hand is so great, however, and the demand for contract supply so heavy, that the temporary relief is very slight indeed. Foreign inquiries are still coming in, but domestic requirements are being held over to a large extent pending lower prices.

The coke situation is becoming easier, owing to better shipping facilities, and also to the increased production. The oven price on Connellsville coke has declined 40 cents a ton for furnace and 25 cents for foundry, present quotations being $2.25 and $3.50 for prompt, and $2.50 and $3.25 for futures respectively.

Metals

Recent developments in copper have left the market in a very strong position, and prices are very firm, with an upward tendency. Tin is lower and inclined to dullness. Spelter is firm at present, but indications are that with increased facilities of production, lower prices may be looked for in the near future. Changing conditions in the lead market may materially affect the situation here, with a comparative reduction in prices. The metal situation is, however, showing little change over recent prevailing conditions.

Copper.—The strength of the copper market is still evident, the demand for this metal showing little cessation. The aggregate sales for the past few weeks is estimated at approximately 300,000,000 pounds, the largest percentage of this being taken by the British Government. The recent heavy purchases for export purposes have left the large producers in the position where they are unable to take further orders under four or five months' delivery. New York is quoting an advance of ¼ cent per pound, present prices being 28¾ cents for lake and 28½ cents for electrolytic.

Local dealers are holding firm on last week's prices, but intimate that higher quotations may be shown shortly.

Tin.—The dullness of the tin market has had much to do with the recent weakness and fall in prices shown. In addition to the quiet condition at present prevailing throughout the trade, the arrival of considerable tonnage and that afloat have had the result of relieving the situation and a decline of 2 cents is noted on the New York market. London reports a further decline on Straits tin, and present indications point to an easier market.

Local conditions are quieter, and quotations are lower, dealers here asking 50 cents, a decline of 1 cent.

Spelter.—The activity in spelter, somewhat pronounced after a period of comparative dullness, has again quieted down, but quotations are firm, and in some instances even stronger than those of last week. American prices show an advance of ¼ cent; New York quoting 19¼ cents per pound. An interesting feature in connection with spelter is that of the increasing facilities for production, which are expected to be put into operation during the present year. The capacity of the new plants will increase the supply of American spelter approximately 800,000 tons. However, as these will not be in operation for many months, they are not expected to have much effect upon present prices. Future inquiries are still active, and early deliveries are hard to obtain.

Dealers here report unchanged conditions, with prices firm at 23 cents.

Lead.—The abnormal condition of late prevailing in the lead market is beginning to show some signs of falling off, and lower prices may be looked for. New York reports a considerable drop in the demand for export metal, and unless the foreign requirements necessitate the placing of additional orders, the possibilities are that the domestic demand will not be sufficient to maintain the present high prices. It is believed that Great Britain is securing considerable lead from Australia, which will relieve the present pressure on the American market, with a resultant decline in present high prices.

Quotations are slightly lower on the New York market, but dealers here report no change, with prices firm at 10 cents.

Antimony.—The market in antimony is very quiet at present, and is developing weakness. The supply is greater than the demand, and prices are declining. New York is quoting 2 cents lower on Japanese and Chinese. Local antimony is quoted at 47 cents, a decline of 1 cent per pound.

Aluminum.—The market is quiet and unchanged, with prices firm at 68 cents per pound.

Machine Tools and Supplies

The situation in the machine tool industry is gradually assuming more normal conditions, and the activity is becoming less pronounced. The bulk of munition making machinery has now been delivered, and, with the exception of a few individual machines, no further orders are meantime in sight. The domestic demand, however, is very encouraging, and inquiries are constantly being received for many different classes of industrial equipment.

It is anticipated that with the approach of May Day some difficulty may be experienced, due to labor troubles, which will materially affect the situation at this time.

The demand for supplies is good, but some inconvenience is always evident owing to the delay in getting delivery.

Old Material

The supply of old material at present is very plentiful, but the demand is not so great; the market is quiet. Some business has been done in heavy melting steel scrap, and coppers are fairly active. The holiday season has had something to do with the recent dullness; but while business is light, prices are very firm.

Toronto, Ont., April 25.—The development of export trade is attracting the attention of business men more than it has done at any time in the past; the possibility of making certain goods in Canada, which are now being imported, is also being given quite serious consideration. Large numbers of industrial plants are fully employed on making war equipment, but as this activity will come to an end sooner or later, the necessity of looking to the future becomes more urgent as time passes. The Department of Trade and Commerce has already taken this matter up, but at the same time the active co-operation of manufacturers is necessary in order to guarantee the success of the scheme. The scarcity of labor in Ontario is becoming a serious matter on account of so many men enlisting, and manufacturers are experiencing considerable difficulty in keeping their factories running at anything like capacity. The situation is likely to become more acute and production will in consequence be curtailed. Manufacturers are also having much difficulty in obtaining raw materials in sufficient quantities to cover their requirements, and there is no sign of any relief in sight. Although the demand is good, the outlook from a manufacturing standpoint is not very promising.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Steel Market

The market continues very strong, and the demand for steel is as insistent as ever. The mills have all the business that they can take care of for the rest of the year, and even that does not cover all the requirements, as it is reported from Buffalo that an inquiry for over two thousand tons of bar material and other finished lines had been received from Canada. Some difficulty, however, is being experienced in closing the business on account of deliveries being so backward. The steel companies are beginning to fear a shortage of labor, a problem which it is expected will become more serious and difficult to remedy. The upward tendency in prices shows no sign of abating, and a number of steel products have advanced during the week. Bar iron has advanced 25c, and is now quoted at $3 per 100 pounds, the same price as steel bars. Steel angles have advanced to $3.50; refined iron, $3.25; Norway iron, $5.50; and band steel, $3.50 per 100 pounds. Twisted reinforcing bars are quoted at $3.25, plus extras for twisting. A new price for cold-rolled shafting has been made, and is now list plus 40 per cent. at warehouse. The wrought iron pipe market is very strong, and higher prices may be looked for. Boiler tubes have advanced in the States, and a similar movement may be expected here.

The demand for sheets in the primary market continues heavy, and operations at the mills are being maintained, notwithstanding the restrictions imposed by the shortage of sheet bars. The sheet market is irregular, and the usual differentials between the various gauges have practically disappeared on account of the big demand for the heavier sizes. Prices are unchanged, but very firm. The high cost of spelter continues to restrict the production of galvanized sheets, and the increased cost of steel has tended to cause a firmer market, despite the falling off in demand. The galvanized sheet market is irregular, and quotations firm and unchanged.

Reports from Sheffield, England, state that results obtained in the manufacture of tungsten powder have been most successful. The quality of the powder is entirely satisfactory, and a greater amount is being produced than was consumed by all Sheffield makers of high-speed tool steel prior to the war. There is still a shortage of supplies of tungsten ore, but it is hoped that arrangements will soon be made for a complete organization of these supplies.

Although there has been some falling off in the amount of new business in the United States market, there is no indication at present of any easing in the prices. The mills have enough business on hand to carry them well over into 1917, and the export demand, especially for bars for shells, is still very heavy. Forging billets have advanced to $68 per ton Pittsburgh. Steel bars have advanced, and are now quoted at 3c, and beams at 3.60c Pittsburgh.

Pig Iron

There is no development of importance to note in the pig iron market, and the situation is much the same as has prevailed for some months. Prices are unchanged, Hamilton and Victoria pig iron being quoted at $24 per ton.

Old Materials

The market is firm, but quiet, the only changes of importance to note being for copper and brass, which have advanced. The copper market has gained strength during the week, and prices of scrap copper have advanced in sympathy. The new prices are about 25c per 100 lbs. higher.

Machine Tools

Machine tool houses report business as having been more active during the week, the demand being principally for standard tools. Deliveries of this class

of equipment have improved, but are not as good as buyers would like. A better demand for large swing lathes is expected in the near future for machining large calibre shells. Machine tool builders are very busy, and firms making special tools are also actively employed.

Supplies.—The tendency for prices continues upward. One important firm has withdrawn prices on cutters, and will only quote on application for some other lines. The linseed oil market is weaker, the price being now around 97c for raw and $1 for boiled oil. It is expected that new and higher prices for cotton and wool waste will be put into effect on May 1. Prices of all imported glues have made a sharp advance.

Metal Markets

An advance in copper and declines in tin, spelter, and lead, are the principal features to note this week. Higher prices for copper were expected on account of the strong market, due to the recent heavy buying. The easiness in the tin market in New York follows a decline in London. The "Trust" price for lead is unchanged at New York, but the outside market is weaker. The spelter market is lower, due to the falling off in demand. Antimony and aluminum are unchanged, both markets being dull. Solders are quoted at the same prices as last week. Business locally is very good. This is due principally to the heavy demand for those metals used in the manufacture of munitions, but ordinary business has improved considerably.

Copper.—The market is strong and higher, with quotations nominal. Prices continue to reflect a strong advancing tendency, and the outlook is favorable to a high range of prices for copper for the rest of this year. Producers are sold up for at least five months, and with a continued heavy demand makes the position of copper an unusually strong one. Copper has advanced 1½c locally, and quotations are nominal at 31½c per pound.

Tin.—The spot market is dull and lower, both in London and New York, due to large arrivals of tin. Futures are, however, firm and unchanged. Tin has declined 2c, and quotations are nominal at 56c per pound.

Spelter.—The market is quiet and easier, the demand for spelter having fallen off. The market is being affected by the strained relations existing between the United States and Germany, and consumers are waiting the outcome. Spelter has declined 1c, and is now quoted at 22c per pound.

Lead.—The "Trust" is holding lead at 7.50c New York, but the outside market has declined. The outside market is still a trifle higher than the "Trust" figure, but this is not of any particular importance, as the demand for premium metal has practically ceased. Lead declined ½c locally, and is now quoted at 10½c per pound.

Antimony.—The market is dull and very little trading is being done. Quotations are unchanged and nominal at 48c per pound.

Aluminum. — The market continues dull, with quotations unchanged at 68c per pound.

Winnipeg, Man., April 22.—Jobbers are finding less difficulty meantime in securing deliveries of machine tools, while enquiries are less frequent. It is understood that most lines of tools can now be delivered within three or four weeks. The supply business continues fairly active, especially for transmission equipment. During the past few months, the demand for saw mill machinery has been exceptionally brisk, one jobber advising that last month he he sold $4,000 worth of such machinery to saw mills. All round, there has been considerable buying.

A number of large Winnipeg shops are very busy on grain elevators, of which many are under construction throughout the West. The demand for flour mill machinery is meantime limited. Taken all round wood-working machinery is quiet, although a number of planing mills here and there are ordering machinery. An order came in from Le Pas this week, and reports indicate that this district will offer good business this year, as there is considerable gold mining going on.

There have been a large number of changes in various iron and steel products. A number of lines of wire goods have taken a jump, new quotations being noted on screw eyes, screw hooks, etc. New prices on sheet tin were issued this week. Copper rivets and burrs have advanced. An increase is also reported in wrought iron pipe, both black and galvanized.

WELLAND LEADS AS POWER CONSUMER

THAT Welland uses more Hydro power than any other municipality in Ontario was the statement made at a joint meeting of the Council and the Hydro-Electric Power Commission held at Welland on April 20 by A. D. McKay, chairman of the commission. Welland's consumption of Hydro power has now reached 73,000 horse-power, and the payments for this power will net the Provincial Commission this year in excess of a million dollars. Welland municipal substation was built three years ago with a capacity of 2,000 horse-power to handle local light and power for the smaller users. This sub-station is now running at 2,160 horse-power in sixty days. The commission asks for $40,000 to build an 8,000 horse-power sub-station. The first year of operation the municipal system showed a surplus of $2,300. Last year it was over $8,000, and the commissioners say this year their surplus will be over $20,000. Since the first day of operation this utility has paid it own way. On the statement of the chairman it has saved to the users of light $60,000 since its inception.

CANADIAN-FRENCH EXHIBIT

THE Export Association of Canada, Ltd., Montreal, has learned through its London office that the exhibit of Canadian manufacturers, which was sent through the Association to the Fair of Samples in Lyons, France, created a very favorable impression among those who attended.

The Canadian exhibitors were fortunate in not having their exhibits held up whilst, owing to the requirement by the French Government of practically every means of transport, even some of the French exhibitors had not their exhibits in place on the date of the opening of the Fair.

The Export Association is extending its work into France as rapidly as conditions will allow. This step of placing Canadian goods before the people of France in an exhibition which will undoubtedly supplant the great Fair at Leipsic, has already exercised a strong influence upon the French people.

TRADE INQUIRIES

THE following trade inquiries have been received at the Department of Trade and Commerce, Ottawa. Particulars may also be obtained from the secretary of the Canadian Manufacturers' Association at Montreal and Toronto:

323. Belting Agency.—A firm in Glasgow, which formerly represented large German importing houses, wishes to obtain the agency of Canadian manufacturers of rubber, leather and canvas belting. Best references.

324. Brass Steam Fittings.—A Glasgow firm wishes to obtain the representation of a Canadian house for the above. Satisfactory references.

325. Steel Billets and Wire Rods.—A Coatbridge firm asks for Canadian sources of supply.

328. Galvanized Fencing Wire.—A Glasgow firm desires to know if galvanized fencing wire can be obtained from Canada. Supplies formerly procured from Belgium.

340. Nails.—A New York firm of exporters desires to be placed in touch with Canadian manufacturers of wire nails, wrought nails, and galvanized wrought nails, to be used for boat building purposes.

331. Wood Screws.—A firm of wholesale hardware merchants at Manchester wishes to be placed in touch with Can-

adian manufacturers of wood screws from ½ inch to 3 inches.

338. Machinery.—The director of a railway in India who has made arrangements for the building of a new plant wishes to be put in touch with Canadian manufacturers of saw-mill and veneering machinery.

CANADA STEAMSHIP LINES

THE most important Canadian vessel deal to be put through since the formation of the Canada Steamship Lines is practically closed. The Canada Steamship Lines will take over the vessel property of the St. Lawrence & Chicago Steam Navigation Co., of Toronto, the steel steamers J. H. G. Hagarty, E. D. Osler, W. D. Matthews and Iroquois, all the boats owned by the latter Company being included in the deal. The price paid for the steamers, which are among the largest and best Canadian vessels on the lakes, was not given out, but at the figures that boats are bringing, it will run into considerable money.

The Hagarty, which is the second largest Canadian steamer on the lakes, has a carrying capacity of 10,000 tons. She was built in 1914, and is 579 feet keel, 58 feet beam and 31 feet deep. The Osler, which was built in 1907, is 491 feet keel, 56 feet beam and 31 feet deep. She came out in 1907. The Matthews, which was built in 1903, has a carrying capacity of 5,600 tons. She is 358 feet keel, 48 feet beam and 28 feet deep. The Iroquois, which was built in 1902, is the smallest boat of the fleet. Her capacity is 3,500 tons, and she is 247 feet keel, 43 feet beam and 25 feet deep. The big steamer W. C. Moreland, which is being rebuilt at the Superior yard of the American Shipbuilding Co., was purchased by the Canada Steamship Lines some time ago.

Trade Gossip

The Magnolia Metal Co., New York, a well known concern making babbitt metals, have we are informed, erected an extensive plant in New Jersey for the smelting of antimony.

The International Time Recording Company of Canada, Ltd., which recently took over the interests of the W. A. Wood, Co., makers of the Globe Time Recorder, has now moved into its large new factory at the corner of William and Anderson Streets, Toronto. This event has especial significance at the present time due to the intimate connection between the Co's. product and the business conditions of the country, the increased output demanded being an accurate indication of present industrial activity. The new plant will come under the supervision of F. E. Mutton, general manager, formerly with the Gibbons Advertising Agency, and the National Cash Register. Arrangements have been made with the parent company in New York whereby the Canadian Company will take care of a large proportion of the export business done with the company's foreign representatives.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Chatham, Ont.—The Canada Flour Mills will instal several 200 h.p. motors in its power plant.

Hamilton, Ont.—The Steel Company of Canada have commenced the installation of two open-hearth furnaces at their plant here.

Hamilton, Ont.—The Cary Safe Co. are contemplating the erection of a plant for the manufacture of safes, vaults, doors, etc.

Sherbrooke, Que.—The Canadian Rand Drill Co. will build a machine shop to cost about $22,000. Anglins, Ltd., of Montreal, are the contractors.

Fredericton, N.B.—The Smith Foundry Co.'s plant was recently damaged by fire. The loss is estimated at $5,000, which is covered by insurance.

Niagara Falls, Ont.—The Dominion Safe & Vault Co., of Farnham, Que., have commenced work on the construction of a factory here, to cost about $7,000.

Hamilton, Ont.—W. Ellis has taken over the Maple Leaf Auto & Garage Supply Co., manufacturers of metal specialties, machinery, tools, etc., and will build a plant on Barton Street.

Montreal, Que.—A. D. Swan, 10 Phillips Place, engineer of the Anglo-Newfoundland Development Co., St. John's, Newfoundland, is in the market for cranes, transporters, electric conveyors, etc., for harbor equipment.

Welland, Ont.—The Canadian Aloxite Co., which has recently been incorporated, will establish a plant at Stamford, near here. It is understood that the company will make an initial investment of from $75,000 to $100,000.

Montreal, Que. — The Canada Iron Foundry Co., which completed a reorganization last fall, is contemplating building an addition to its plant at Three Rivers, Que. Either an entirely new plant will be erected, or a large addition added.

Halifax, N.S.—The Halifax Electric Tramway Co., Lower Water Street, is having a gas plant constructed in Halifax, and is calling tenders for the erection of a by-product building, cold storage building and for elevating and conveying machinery in connection with the plant. The engineer in charge is H. R. Barrett.

The International Nickel Co. has informed the Dominion Government of its intention to begin the erection of the Canadian plant immediately. The company is understood to have under consideration a site on the Atlantic coast somewhere in the vicinity of Halifax, although the exact details in regard to this have not been given.

Cobalt, Ont.—The Croesus gold mines in Munroe Township are considering the building of a mill. The incline shaft is being sunk from the 300 to the 400-foot level. A little ore from the Croesus has been milled in the mill on the Gold pyramid property, but the plant was so out of date that only a very poor recovery was made and the new mill, if erected, will contain the very latest practice.

Edmonton, Alta. — The Edmonton Power Co., which was organized by G. W. Farrell & Co., of Montreal, has made an agreement with the City of Edmonton covering a period of 21 years for a minimum annual supply of electric energy of 35,000,000 kilowatts at the rate of 1c per kilowatt hour during the life of the contract, the price to decrease on a sliding scale until the consumption of the city reaches 110,000,000 when the rate becomes ½c per k.w. hour.

Sir John Jackson, Ltd., of London, England, it is understood, has been awarded a contract for the dam and power house. Another important feature is an electric railway to be constructed to the site of the dam, and it is thought that two seasons will be necessary to complete the railway. The power line from the generating source will be brought down the south side of the Saskatchewan River.

Electrical

Welland, Ont.—The Welland Hydro Commission have asked the council for an appropriation of $40,000 to build and equip a new sub-station of a capacity of 8,000 h.p.

Port Carling, Ont.—The ratepayers will vote on a by-law on May 15 to sanction an expenditure of $1,000 for purpose of supplying electric lamps, etc., and connections.

Arthur, Ont.—A by-law will be voted on by the ratepayers on May 8, to raise $15,000 for the purchase of John Philip's electric lighting system and to provide for the cost of a plant to distribute electric power, to be supplied by the Hydro-Electric Power Commission.

Municipal

Ridgetown, Ont.—The ratepayers will vote on a by-law to authorize an expenditure of $10,000, to complete the waterworks system.

Saskatoon, Sask.—The city council have decided to submit a by-law to the ratepayers in connection with the proposed incinerator.

Cornwall, Ont.—The Town Council contemplate extensions to the waterworks system, and will require a turbine, pumps, and cast iron pipe.

Rodney, Ont.—A by-law will be voted on by the ratepayers to authorize an expenditure of about $7,000 on a light and power distribution system.

Port Moody, B.C.—The proposal to guarantee the ship-building company bonds to the extent of $200,000 passed by a majority of 99 for the measure.

General Industrial

Fort William, Ont.—The Paterson Grain Co., will build an addition to one of their elevators here.

Hamilton, Ont.—The Graselli Chemical Co. will build an addition to the factory at a cost of about $30,000.

Sandwich, Ont.—The Canadian Salt Co. will shortly begin the construction of an addition to their plant here.

Petrolia, Ont.—It is reported that a syndicate will build a flax mill here at an approximate cost of $100,000.

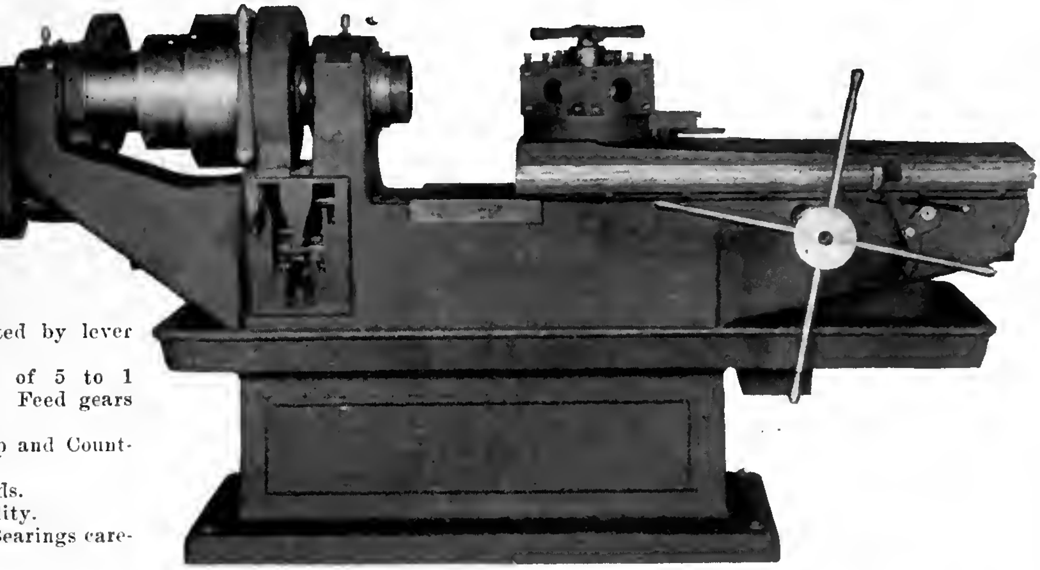
Mitchell, Ont.—The Mitchell Woollen Mills will make an extension to their plant. The cost will be about $5,000.

Medicine Hat, Alta.—The plant of the Dominion Harvester Co. here was de-

GREENSBORO TURRET LATHE

For Boring and Recessing Base of 4.5 and 6" Shells

Spindle is made of Carbon Steel, 8" diam. in front bearing and bored 6¼" diam. 8" deep, so part of shell is held within bearing to prevent overhang.
Spindle runs in heavy bronze bearings.
Head has friction back gear, 5½" belt.
Turret is bored for 3" Bars, has power feed with automatic stop.
Quick-change feeds operated by lever under head.
Turnstile has a leverage of 5 to 1 though gearing into rack. Feed gears made of steel.
Equipment: Oil Pan, Pump and Countershaft.
Weight: About 6,000 pounds.
Workmanship of Best Quality.
All Spindles ground. All Bearings carefully scraped.



THE A. R. WILLIAMS MACHINERY CO., LIMITED
TORONTO CANADA

"Here is a Die Head that you can depend upon"

A Geometric Self-Opening and Adjustable Screw-Cutting Die Head

They are being used with absolute satisfaction on every make of Screw Machine.

A micrometer adjustment makes possible quick and accurate variations for a tight or loose-fitting screw. The chasers open automatically, so that no backing off occurs to injure the thread. Length of thread accurately governed—short or long.

Arranged for cutting any diameter, pitch and form of thread. Right or left-hand. Flush to shoulder, where required.

Let us recommend the right sort of Die Head for your work.

The GEOMETRIC TOOL COMPANY
NEW HAVEN, CONN., U.S.A.

CANADIAN AGENTS: Williams & Wilson, Limited, Montreal.
The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg, St. John, N.B.

stroyed by fire on April 20. The loss is estimated at $65,000.

Port Arthur, Ont.—The Davidson-Smith Co. will build a million bushel addition to their elevator here. The contract has been awarded to the Barnet-McQueen Co., and the cost is estimated at $300,000.

Toronto, Ont.—The Flint Varnish & Color Co., which was recently incorporated, has purchased the Chevrolet Motor Co.'s factory. Additional buildings will be erected and equipment installed for making paints and varnishes.

New Toronto, Ont. — The Goodyear Tire & Rubber Co., will erect one of the largest and most up-to-date plants for the manufacture of tires in Canada at the corner of Ninth Street and Lake Shore Road. The factory will be a fireproof structure, and will be constructed of brick and steel. The total cost is estimated at $200,000. The site has been purchased.

Tenders

Burlington, Ont.—Tenders will be received up to Saturday, May 13th, 1916, for a two-ton combination chemical engine hose truck. Specifications on application. Jas. S. Allen, clerk.

Dartmouth, N.S.—Tenders for the completion of a foundry for the Williston Steel Foundry Co. are being received by the C. Hedley Williston, 504 Robie Street, Halifax, N.S. Estimated cost, $16,000.

Toronto, Ont.—Tenders will be received up to Tuesday, May 9th, 1916, for the supply of two gasoline-driven diaphragm pumps. Specifications may be obtained from the Works Department, Room 6, City Hall, Toronto.

Hamilton, Ont.—Tenders will be received up to Monday, May 8th, 1916, for supplying mechanical rakes and appurtenances for Gage Avenue pumping station. Plans and specifications may be obtained upon application to A. F. Macallum, city engineer.

Toronto, Ont.—Tenders will be received by the Chairman Board of Control, City Hall, up to Tuesday, May 9th, 1916, for the supply of two gasoline-driven diaphragm pumps. Specifications and forms of tender may be obtained at the Works Department, Room 6, City Hall.

Sherbrooke, Que.—Tenders will be received until April 29th, 1916, for a power pump of the capacity of four million Imperial gallons per twenty-four hours; also a vertical water wheel, flume, shaft, brackets, etc., to operate the above-mentioned pump. Specification and plan can be seen at the office of City Engineer Tremblay, Sherbrooke, P.Q.

Regina, Sask.—Tenders for glass insulators, boppings, connecting sleeves, Cross arms, galvanized iron wire, pole line hardware, steel strand wire, anchor rods will be received until May 6. Specifications, form of tender and all information may be obtained on application to the Department D. C. McNab, Deputy Minister, Department of Telephones, Regina.

Toronto, Ont.—Tenders, addressed to the secretary-treasurer of the Board of Education, will be received until Thursday, April 27th, 1916, for ornamental iron fencing, Roden School, and also for supplying linseed oil, turpentine and sundry material for painters' work. Specifications may be seen and all information obtained at the office of the superintendent of buildings, City Hall, Toronto.

Ottawa, Ont.—Tenders for submarine cable will be received at this office until Monday, May 15, 1916, for 10 knots of single conductor submarine telegraph cable (107 lbs. copper and 150 lbs. gutta percha per knot), with sheathing of 12 No. 8 S.W.G. iron wires, to be delivered at Halifax, N.S. Specification and forms of tender can be obtained on application to the office of the general superintendent of the Government Telegraph Service at the Department of Public Works, Ottawa.

Toronto, Ont.—Tenders, addressed to the Secretary-Treasurer, Board of Education, will be received until April 27, for the following trades, for completion of Administration Building, College street: Ornamental iron work, spiral stairs, iron railings, etc., leaded lights, elevator, ash hoist, vault doors, hardware trimmings, also temperature regulators for Dewson street school; cabinet work, plumbing and electrical work, Lee school. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall, Toronto.

Personal

A. J. Randall, formerly manager of the Saskatoon Iron Works, Saskatoon, Sask., has gone to Winnipeg, where he will take an officer's course.

J. Quail, formerly sales engineer of the Manitoba Bridge and Iron Works, Winnipeg, has accepted a position with the Canadian Bridge Co., of Walkerville, Ont., as manager of their Winnipeg office.

William Southam of Hamilton, Ont., has resigned his position as director of the Steel Company of Canada. Mr. Southam was one of the original directors of the company and has been closely associated with the steel interests of Hamilton for twenty years.

Dr. William Frederick King, chief Astronomer of Canada and Commissioner for the Survey and Marking of International Boundaries, died on April 23, at the Observatory residence, Ottawa, Ont. The late Dr. King was born at Stowmarket, Suffolk, England, 62 years ago, coming to Canada with his parents eight years later. He entered the service of the Dominion Government in 1872 as Assistant Astronomer on the North American Boundary Commission, and became Inspector of Surveys for the Dominion in 1881. He was made Chief Inspector of Surveys in 1886 and Chief Astronomer of the Department of the Interior in 1890.

Building Notes

Toronto, Ont.—George Kerr has made application to the City Architect for permission to erect a two-storey brick building at 108 Nassau Street, to be used as a dairy. It is estimated that the cost of the building would be $5,000.

Wood-Working

Lindsay, Ont.—Reeve Tiers' planing mill at Fenelon Falls was completely destroyed by fire on April 18. There is no insurance.

Stratford, Ont.—The McLagan Furniture Mfg. Co. propose building an addition to their factory at a cost of about $30,000.

Contracts Awarded

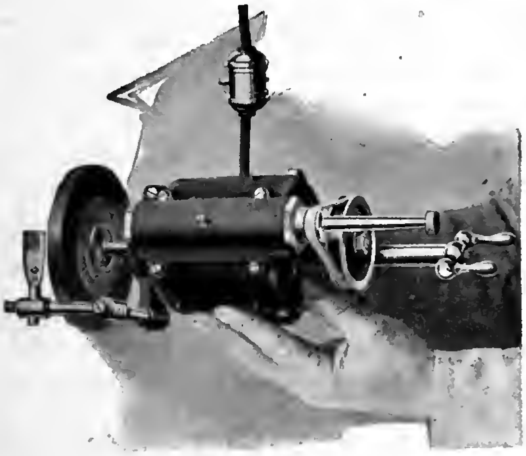
Galt, Ont.—The Galt Foundry Co. has been awarded a contract for the supply of castings by the City Council.

Saskatoon, Sask.—James Priel has been awarded a contract for the extension to the power house at $9,882.

Railways—Bridges

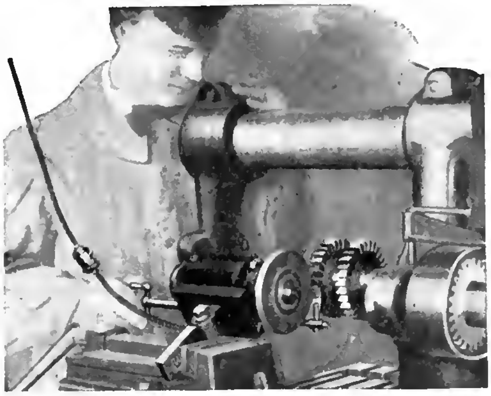
The Pas, Man.—Steel laying on the Hudson Bay Railway will be resumed on May 1 from mileage 242. The steel cantilever bridge at this mileage was completed to-day and trains will be operated over it shortly. There is a demand for railway laborers and 1,000 men are required to carry on the season's construction programme.

Aikenhead's DUMORE GRINDER



The DUMORE Portable Grinder. The only small grinder giving wheels the correct surface speed. Speed, 30,000 R. P. M.

This GRINDER has become known as the most **efficient** portable grinder. Wherever there is grinding to be done it is as valuable as the services of one or two extra men. The DUMORE does all kinds of grinding, longitudinal, cylindrical, internal and other hard-to-get-at jobs. It is equipped with a rest for grinding cutters, enabling the operator to grind his cutters right on the Miller Arbor, whether angular, straight or spiral.



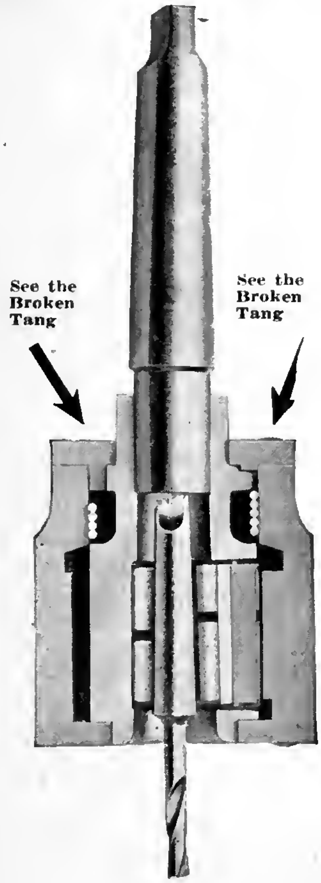
A rapid, practical way of grinding milling cutters.

The best way for you to know how much the DUMORE Portable Grinder will mean to you will be to try one out. Let us ship you a DUMORE.

Aikenhead Hardware Limited

17, 19, 21 Temperance Street

TORONTO - - - CANADA



Don't Throw Away Broken Tang Drills

Perhaps you are about to discard some taper shank drills because the tangs are broken off —DON'T DO IT—they are worth their weight in gold. You can use them just as they are with a

Wahlstrom Automatic Chuck

One chuck holds drills from 1/16" to 1¼"

and you won't have to take time from your production to repair them.

Tool changes are made in two seconds—just grasp the shell of the chuck with one hand and put in or remove the tool with the other—no collets—no lost time, for the spindle never stops.

The jaws grip NOT BY THE TANG, BUT ON THE SIDE OF THE TAPER—there's no chance for slippage—a Wahlstrom won't even mar the shanks.

CANADIAN DEALERS:

Aikenhead Hdw. Co., Toronto, Ont., Canada
Williams & Wilson, Ltd., Montreal, Quebec, Canada

Wahlstrom Tool Company

350 Carroll Street Brooklyn, N.Y.

Trade Gossip

The Lauzon Engineering Co. has increased its capital stock to $150,000.

The Berlin Machine Works has changed its name to that of P. B. Yates Machine Co., Ltd.

The Govan Motor & Machine Co., of Govan. Sask., has recently been incorporated with a capital of $20,000.

The Canadian Western Zinc Smelting Co., of Calgary, Alta., has been incorporated with a capital of $1,000,000.

Hamilton, Ont. — If the proposed coke plant is established, there is a possibility of the International Nickel Refining Co., also building a plant here.

Halifax, N.S.—At a meeting of the shareholders of the Nova Scotia Car Works, held recently, it was decided to sell the entire plant. The Eastern Trust Co., of Halifax, are the liquidators.

United States Steel—Official denial is given to reports which recently have been current to the effect that the United States Steel Corporation had abandoned its plans to erect a large new plant at Ojibway, Ont.

Newfoundland Prosperous.—A preliminary statement on the Colonial budget, issued at St. John's, Nfld., on April 20, indicates that Newfoundland is in the strongest financial position in the colony's history. Officials estimate that there will be a surplus of $60,000 for the fiscal year ending in June next, and that the next year also will show a large surplus, notwithstanding the loss of $250,000 in revenue, which will follow the going into effect of the prohibition law next January.

The Panama Canal was reopened to traffic on April 15, with the passage of sixteen ships, seven northbound and nine southbound, including the transport Buford. The channel through Culebra cut was in excellent condition and the passage of the vessels was without incident.

Increase Price of Rails.—The United States Steel Corporation announced on April 14 that after May 1st contracts placed for Bessemer and open-hearth steel rails for delivery after May 1, 1917, will be at the rate of $33 a ton. The present price of $28 a ton has prevailed for thirteen years.

The Canadian Hoskins Ltd., of Walkerville, Ont., makers of gas and oil furnaces and pyrometers, have opened an office at 526 Traders Bank Bldg., which is in charge of Geo. F. Sheppard. The company also announce that the Montreal office has been moved to larger quarters at 224 St. James street.

W. W. Wells, 370 Victoria Street, Toronto, recently supplied the Taylor-Forbes Co., Guelph, Ont., with a 2,000 ampere generator for their electro-plating department. The machine is of the two and three wire type combined, and can be used on either system without alteration to the machine terminals.

Ontario Commission Named.—The personnel of the Provincial Commission appointed to secure the organization of the resources of the province for efficient co-operation with the federal authorities in the prosecution of the war, and the maintenance of the agricultural and industrial production is: Sir John Hendrie, (chairman), Premier Hearst, N. W. Rowell, Hon. J. S. Duff, Hon. T. W. McGarry, Hon. G. Howard Ferguson, C. M. Bowman, C. A. Gillespie, S. Ducharme, W. D. McPherson and Dr. Forbes Godfrey.

War Orders Come to Canada.—The announcement was made on April 19 that since the establishment of the credit of $75,000,000 for the British Government in Canada by the chartered banks, at the instance of the Government, $80,000,000 worth of orders for munitions and supplies have been placed in the Dominion by the Imperial authorities. Sir Thomas White announced on March 15 last that the credit for the British Government had been provided as a result of an offer made by the Canadian Bankers' Association, on behalf of the banks, after conferences between himself and that body which had extended over several weeks.

Merchant Marine Advocated.—Col. Thomas Cantley, president of the Nova Scotia Steel & Coal Co., delivered an address before the Canadian Manufacturers' Association in Montreal on April 19, in which he urged the building of a Canadian merchant marine in Canadian yards, by Canadian steel, and to be manned by Canadian sailors. He declared that since the war broke out Canada had captured part of the heavy casting trade of the Clyde, which was formerly held by the Germans. Many of the big shipping men of the port were present and expressed complete sympathy with the views of Mr. Cantley.

Railroad Earnings Increase.—Aggregate earnings of the three big Canadian railroads in the second week of April show one of the largest gains of the year to date, $1,241,047, or 40.9 per cent. This compares with an increase of $1,083,166 or 33.5 per cent. in the first week of the month. The total of the week was slightly lower at $3,294,907 than in the first week, but as noted the increase over the corresponding period a year ago was larger. The C.P.R. return was the feature, earnings topping those of the first week of the month, while Grand Trunk and C.N.R. figures were slightly lower.

The Canadian China Clay Co., which was formed for the purpose of developing the kaolin deposit in Amherst township, Quebec, is now applying for a Dominion charter, the capital of the company to be $1,500,000. Laboratory tests carried out in France, the United States and Canada, it is claimed, have demonstrated that the Canadian clay, in addition to high ceramic value, possesses all the characteristics necessary for the manufacture of the highest grades of paper and of certain paint pigments. J. C. Braderick is managing director of the new company and among others interested are Sir Wm. Mackenzie, Sir Donald Mann, Andrew Shearer and A. G. Gardner.

U. S. Zinc Production.—Production of zinc ores in the United States for the first quarter of the current year has been 168,669,204 pounds, valued at approximately $8,500,000, compared with an output of 125,693,811 pounds sold for $3,636,155 in the first three months of 1915. Lead output for the three months has been 25,755,574 pounds, valued at $1,096,735, as compared with 18,840,200 pounds sold for $443,303 during the first quarter of last year. At present rate of production, value of this year's output of zinc and lead ores in Joplin district will exceed $40,000,000, as compared with last year's record-breaking figure of $26,000,000.

New Incorporations

The Alexalite Company has been incorporated at Toronto with a capital of $40,000 to manufacture electrical light fixtures and appliances. Head office, at Toronto. Harry Rohleder of Toronto is attorney.

W. H. Banfield & Sons has been incorporated at Toronto with a capital of $150,000, to take over as a going concern the machine tool manufacturing business carried on by W. H. Banfield & Sons, of Toronto, Ont.

Fowler Machine Works, Ltd., of Vancouver, B.C., has been recently incorporated with a capital of $10,000, to carry on the business of ironfounders, mechanical and electrical engineers, brassfounders, boiler-makers, etc.

The E. J. Longyear Company has been incorporated at Toronto, Ont. with a capital of $30,000 to develop and operate mines and mineral deposits. Head office, Sudbury, Ont. William E. Smith of Sudbury, Ont. is the attorney.

The Mutual Elevator Co., with a capital stock of $500,000 and head office in Winnipeg, has been incorporated. F. H. Bole and D. H. Bole, of Fort William, J. T. Haig, A. A. Adams and J. Keelan, of Winnipeg, are the provisional directors.

The Garlock Walker Machinery Co., Ltd., has been incorporated at Toronto, with a capital of $47,500 to manufacture and deal in machinery. Head office in Toronto, Ont. Incorporators, James W. Bicknell and William C. H. Swinburne of Toronto.

The Doyle-Dennert Tractor Co., has been incorporated at Toronto with a capital of $150,000 to manufacture farm tractors and motors, etc., at Essex, Ont. Incorporators, W. C. Doyle, William Nesbitt and G. W. Doyle all of Essex, Ont.

The Canada Boxboard Co., has been incorporated at Ottawa with a capital of $1,000,000 to manufacture cardboard and other products of pulp. Head office at Toronto. Incorporators, George Macbeth, George R. Sproat and F. M. McDowell all of Toronto.

The Hayes Wheel Company of Canada has been incorporated at Ottawa, Ont., with a capital of $200,000 to manufacture automobiles and motor truck wheels etc., at Chatham, Ont. Incorporators, R. H. Parmenter, A. Thomson and William S. Morloch all of Toronto.

The Joliette Steel Co., Ltd. has been incorporated at Ottawa, Ont. with a capital of $100,000 to manufacture

steel, iron and other products. Head office, Montreal. Incorporators, James K. Stinson, Ernest V. Moore and E. Lorne Stinson all of Montreal.

The Bournonville Rotary Valve Motor Co., Ltd., has been incorporated at Ottawa with a capital of $500,000 to manufacture mechanical and electrical appliances. Head office at Toronto. Incorporators are W. Gilchrist, J. Stewart and H. J. Stewart all of Toronto.

The Menard Motor Truck Co. Ltd., has been incorporated at Ottawa with a capital of $250,000 to manufacture motors and other vehicles at Windsor, Ont. Incorporators, W. N. Gatfield of Sandwich, Ont., Fred Hurst Neal and William H. Neal both of Windsor, Ont.

The Barton Feeders Co., of Hamilton, Ont., has been incorporated to manufacture furniture, nails, horse shoes, machinery, tools, vehicles of all kinds, etc., $40,000 capital, by Hugh J. McKenna, Leewellyn F Stephen, William J. Lord, and others all of Hamilton, Ont.

The M. F. P. Aeroplane Ltd., has been incorporated at Ottawa, Ont., with a capital of $500,000 to manufacture all kinds of aeroplanes, hydroplanes, etc., Head office at Toronto. Incorporators are W. Gilchrist, James Stewart and Hamilton James Stewart all of Toronto.

The John Dixon & Co., a corporation created under the laws of Great Britain, has been granted a license to manufacture machine rules, hot presses, glazers, etc., $40,000 capital stock; Reginald G. Allder, of Toronto, Ont., has been appointed attorney.

The Homo Chocolate Creamery Co. has been incorporated at Ottawa, Ont., with a capital of $100,000, to manufacture all kinds of products in which chocolate, cream or milk forms the principal part. Head office at Montreal, Que. Incorporators: F. Monnette and G. Roberts, of Montreal, Que.

The Louden Machinery Co. of Canada, Ltd., has been incorporated at Ottawa, Ont., with a capital of $250,000, to manufacture machinery, barn equipment, hay tools and implements, etc. Head office at Guelph, Ont. Incorporators: James E. Day and Joseph P. Walsh, of Toronto, Ont.

The Dominion Cutlery Co., Ltd., has been incorporated at Ottawa, with a capital of $100,000 to carry on business as manufacturers of cutlery, plated ware and articles made in metal. Head office at Montreal, Que. Incorporators are, M. A. Phelan, A. Lafontane and Harry L. Coombs all of Montreal.

The Dominion Sugar Co., Ltd., has been incorporated at Ottawa, Ont. with

a capital of $5,000,000 to carry on business as sugar manufacturers, etc. Head office, Wallaceburg, Ont. Incorporators, Henry B. Smith of Bay City, Mich., Charles H. Honson and Herman Weise of Wallaceburg, Ont.

The Canadian Steel Specialty Co., has been incorporated at Toronto, with a capital of $100,000 to carry on a general steel manufacturing business and to manufacture every description of iron and steel. Head office, Grimsby, Ont., Incorporators, Harry George Hess, and Jesse H. Foster of Grimsby, Ont.

Catalogue

"Waterproof Graphite Grease" is the the title of a new 16 page booklet gotten out by the Joseph Dixon Crucible Co., Jersey City, N.J. This valuable little book explains fully, in a concise and clear way how many difficult lubricating problems have been overcome. It also deals with the care and up-keep of heavy, slow-moving machinery and parts that are exposed to unusual wear. Some of the subjects treated are lubrication of elevator plungers, the best way to handle wire rope, open gearing, dredging machinery, and rolling mill lubrication, the lubrication of sugar rolls, pulp and paper machinery. A copy of this booklet will be gladly sent to anyone interested.

Book Review

The Canadian Mining Manual for 1915, edited by Reginald E. Hore, and published by Mines Publishing Co., Toronto, Ont. This manual, as in previous years, contains a great deal of interesting and useful information, covering the mineral production and mining industry of Canada. One of the main objects of the publication of this book is to carry into other countries reliable information concerning the minerals and mines of Canada, at the same time it serves as a record for those interested in the subject in this country. The manual is arranged in five sections. The first covers a review of mining in Canada in 1915, while the second deals with mine products, and includes a description of the various minerals found in Canada and method of treating the ores. Section three consists of a review of the mineral production in each of the various provinces, written by reliable authorities. Particulars of the mining companies operating in Canada are given in section four, while section five gives Canadian mining companies listed according to product. The manual contains over four hundred pages and is bound in attractive red cloth covers.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, MAY 4, 1916 No. 18

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 34 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Machining and Assembling the Military Rifle Bayonet

By F. H. Mayoh

Bayonet manufacture, like that of shells, has been both war-initiated and war-stimulated, although as far as we are concerned the latter has demanded and monopolized the full extent of our metal-working plant activities. Bayonet production, it will be noted, is quite distinct in its operation features from that of shells; as a result our readers will find in the accompanying articles a welcome diversion, besides obtaining at the same time a further insight into the manufacture of another and highly important piece of the individual soldier's equipment, offensive as well as defensive, and particularly effective in either case.

Bayonet manufacture presents to the machine shop an entirely different proposition from the general run of war implements inasmuch as the operations required are chiefly milling, while those on other munitions are largely turning. The usual impression which a bayonet conveys, apart from its cutting qualities, is the case with which it is attached to the rifle, and by referring to Fig. 1 this point is clearly brought out.

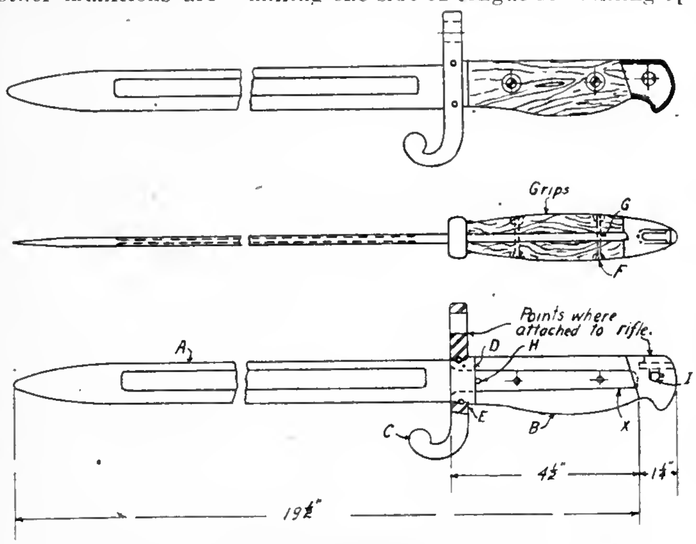


FIG. 1. DETAILS OF BAYONET CONSTRUCTION.

Construction

These convenient weapons for close combat are made in three main steel parts, the grips and a number of smaller pieces. The blade, A. is made from a good grade of tool steel, and is drop-forged from the bar. The hilt, B, and guard, C, are mild steel forgings and are practically machined all over. The two grips are of black walnut, while the other fittings are from commercial stock with such exceptions as are later described.

The commercial bayonet is a highly finished product, well made and conveniently assembled. The end of the blade is tapered to fit between the prongs of the hilt at X, while two plates, D, pin these prongs together. The guard fits over these plates, and two pins, E, are used to hold the guard in place. The grips are held in place by special nuts, F, and studs, G, while the bayonet blade is prevented from pulling out of place by the pin H. The lock for holding the bayonet to the rifle barrel is shown at I, which is assembled with a bushing and a spring for operating the lock while putting the bayonet in place or removing same.

As the blade of a bayonet is the one essential feature about which the rest is built, it will be considered first. This is made from a good grade of tool steel rough forged to the shape shown at A, Fig. 2, and is finished, mostly by milling, to the shape shown at B.

Nature of Operations

The operations on the blade consist of milling one side of tongue A—milling opposite side of tongue B—mill back edge of blade C—mill front edge of blade D—mill back edge of tongue, straight and taper E—mill front edge of tongue, straight and taper F—mill end of tongue on radius G—mill groove, one side H—mill groove opposite side I—mill back taper of one side K—mill back taper opposite side L—mill cutting edge M—mill cutting edge N—drill the three holes—mill out corners in grooves—grind point and cutting sides to shape—harden and temper. Throughout the machining on these blades, gang milling fixtures and cutters are used quite extensively as production is quantities is an important consideration, and further, the machining operations are required largely for retaining the high qualities of the steel, which would be lost in forging to a fine edge unless very carefully done.

Referring to Fig. 3, the fixture for milling the side of the tongue is shown. In this tool the work is set upon a steel seat at A, located against the block B by the point of the blade; a sufficient number of blades being placed in the fixture to take up the complete travel of the table. The blades are clamped two at a time by expanding jaws, C, against locating seat, D. Under the free end of the blades, spring pins, shown at E, are used to steady the work. The cutters used are a gang of two which feed in the direction of arrow and cut the step shown.

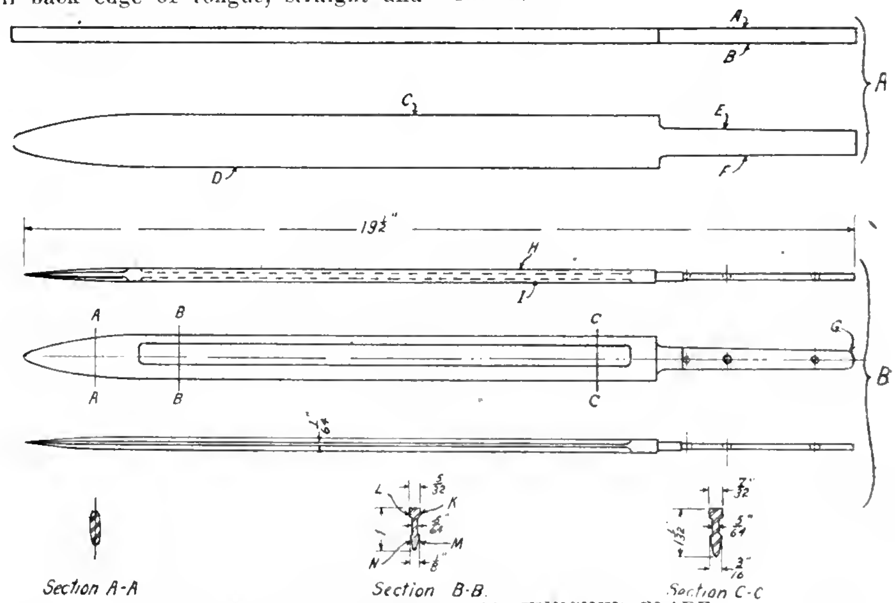


FIG. 2. (a)—ROUGH FORGING. (b)—FINISHED BLADE.

For milling the other side of tongue a similar fixture is used with the exception that instead of turning the work over in

the natural manner, it is turned over end for end as shown below in Fig. 3, thus bringing the points of location on the tongue in the same place on both fixtures, although the fixtures will be left and right hand.

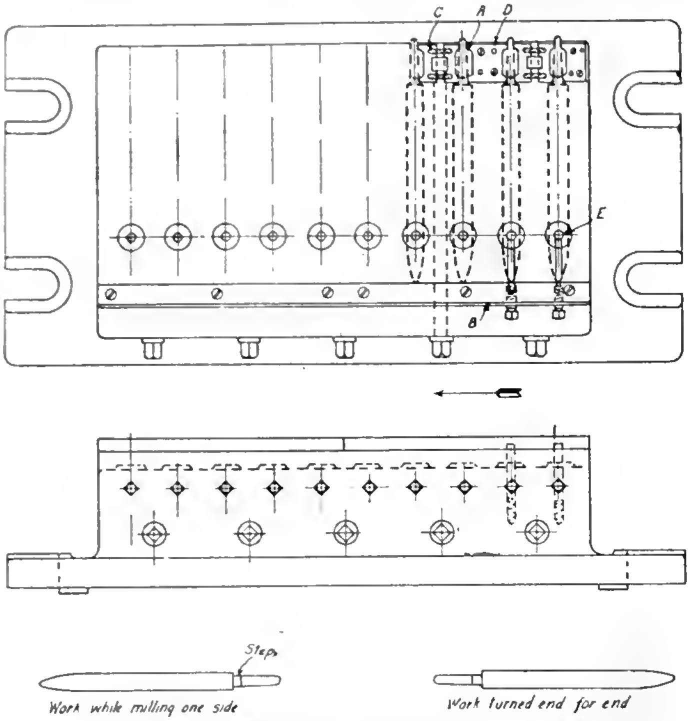


FIG. 3. FIXTURE FOR HOLDING BLADES WHILE MILLING SIDES OF TONGUE.

To mill the back edge of blade advantage is taken of the tongue just machined for holding the work by jaws A, Fig. 4. The blades are here set upon the seat B, while jaws C are held against the sides of the blades by means of springs D to support them against the cut, these strips being locked by the screws E while taking the cut. The jaws A which grip the tongue are positive and are locked by a tapered bushing F and screw G, it being necessary to clamp with these jaws before tightening the spring jaws as the work is thus located.

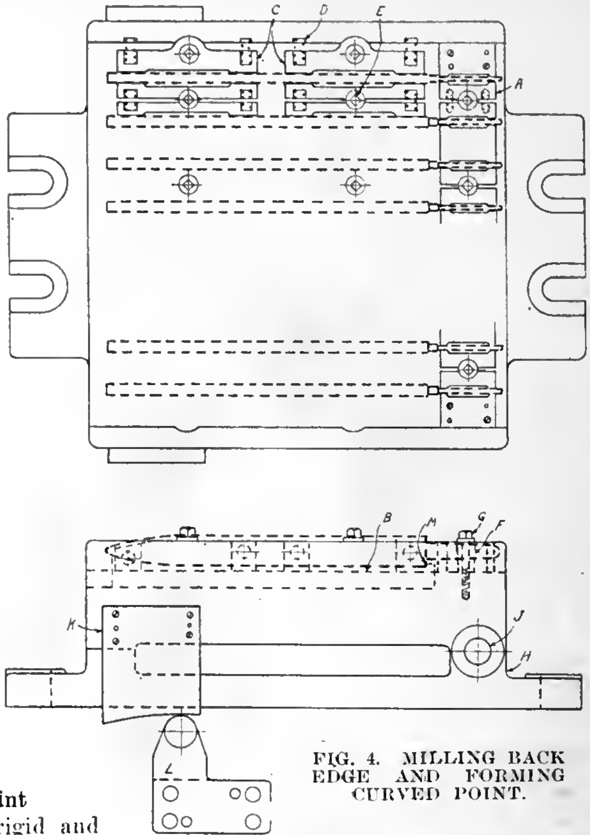


FIG. 4. MILLING BACK EDGE AND FORMING CURVED POINT.

Milling Curved Point

This provides a very rigid and effective means of gripping the blades while edge milling, but one thing which must be included in this fixture is the means of milling the curve at point of blade. This is accomplished by setting the fixture on a sub-base H, and allowing it to pivot at J, when by placing a formed block at each side of fixture K and mounting suitable blocks, L, on side of milling machine table knee, the fixture will ride over the blocks and cause the cutter to form the curve at point of blade. The front edge of blade is milled in the same manner, using locating blocks to fit the form at back of blade just finished, the location endwise in both fixtures being obtained by the curved end forcing the blade against the shoulder of the tongue M.

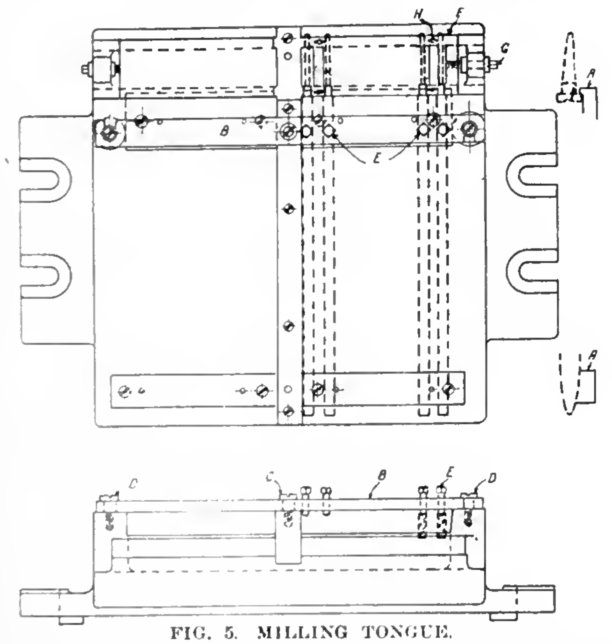


FIG. 5. MILLING TONGUE.

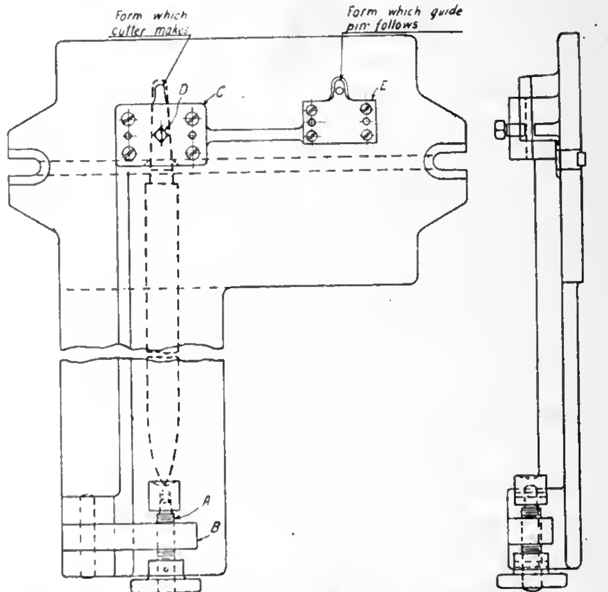


FIG. 6. FIXTURE WITH FORM FOR PROFILING END OF TONGUE.

To mill the back and front edges of tongue, including the straight and tapered portions, the blade is seated on the edges, with a swing block which carries screws, to hold the work down, while the gripping is done by blocks which bind the sides of tongue. For this purpose a

fixture shown at Fig. 5 is employed. The work is located against the block A, and is clamped by the screws E. These screws are placed in the swing block B, which pivots on the stud C and hooks under the screws D. The tongue of the blade is clamped by the block F, which is adjusted through the screw G. The screws shown at H hold the locating blocks in place and the holes for these screws are elongated to permit the blocks to float for taking up the variations in the thickness of the tongue, although these tongues are held very close to standard size.

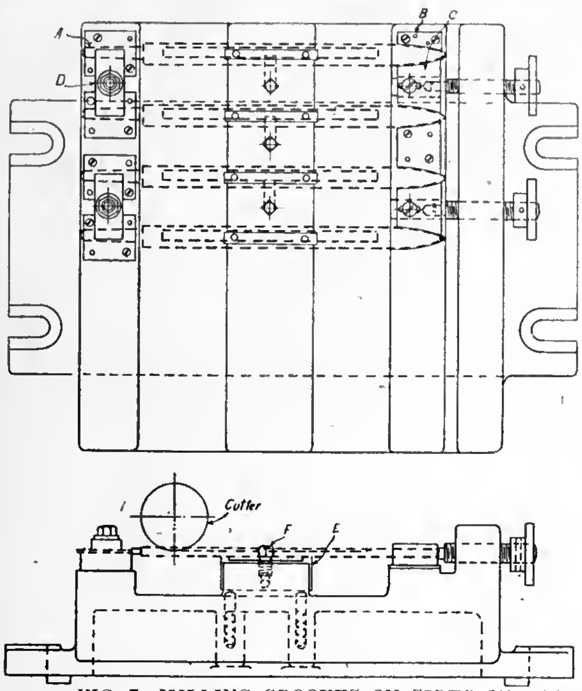
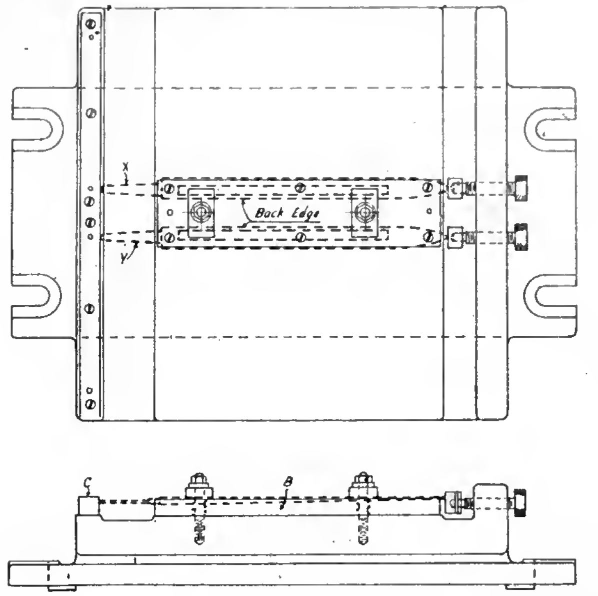


FIG. 7. MILLING GROOVES ON SIDES OF BLADE.



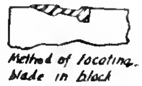


FIG. 8. LOCATING BLADES FROM BACK EDGE WHILE MILLING CUTTING EDGE.

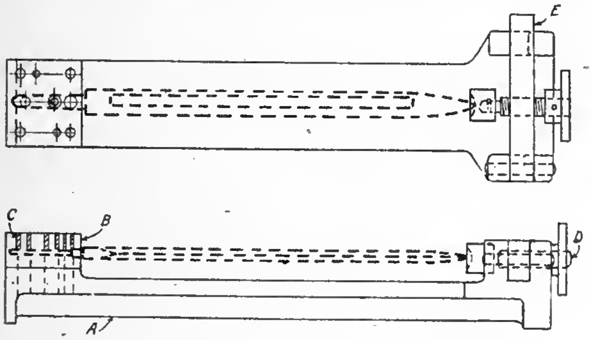


FIG. 9. DRILL JIG FOR HOLES IN TONGUE.

Profile Milling

All of the fixtures so far described are

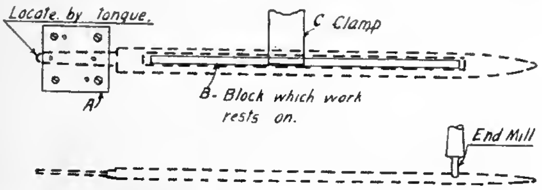


FIG. 10. METHOD OF MILLING OUT CORNERS IN GROOVE

for gang milling. The next fixture, Fig. 6, for machining radius at end of tongue, is a profile milling fixture for handling one piece at a time, and is simple to operate, although requiring the constant attention of the operator. In this profile milling fixture the screw A is held in swinging piece B, and is swung clear of the point of blade, the tongue of the blade being slipped into block C, and screw A locating it in the position shown. The screw D securely holds the blade in place. The formed block, E, has the same curve as the end of the tongue and is for guiding the pin which governs the form the cutter will make, as the operator feeds the to make the cut.

Milling the grooves is another operation where gang milling is used to good advantage, although an extra cut must be taken to remove the corner left by the cutter. The fixture used, shown in Fig. 7, provides for locating the work by the tongue in block A. It is clamped against the formed block B by wedge C at point end, and is clamped on top of tongue with strap D, one clamp and one wedge being used to grip two pieces in their respective positions. For taking the downward spring of the work under the cut, spring blocks are used under the rough side and clamped by screws F. When one groove is finished the blade is prevented from springing under the cut by a fixed block in place of the springs and floating block. In this operation it is necessary to raise the table to commence cutting and to lower the table to remove the work. When milling back taper K and L, Fig. 2, a fixture similar to the foregoing with a block in under side groove to prevent spring of blade is used, the block being tapered to bring point end of blade higher than tongue end which causes the blade to be milled taper.

Forming the Cutting Edges

To mill the cutting edges, reference is made to Fig. 8 where both sides of the cutting edge are milled in the same fix-

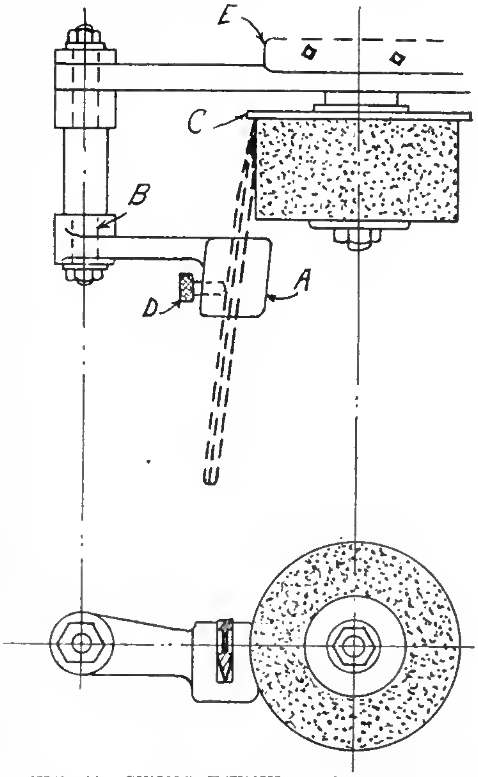


FIG. 11. SWING FIXTURE FOR GRINDING POINT.

ture, the blades being placed in pairs, X and Y, back to back with a clamp between them; the blades being set in the fixture on the blocks B, which fit the

groove and back taper previously machined. The back edge locates the blade lengthwise and the thrust of the cut is taken by the end of tongue against block C. The blades in this case are tipped in two directions to give approximately the compound angle necessary to obtain the dimensions as given on the section shown by Fig. 2.

Drill Jig

With the exception of one minor but necessary operation the milling is now complete, and the next operation is to drill the three holes in tongue, using the simple jig, Fig. 9. This jig consists of the base A and cap B, into the latter of which is cut a form to receive the tongue of bayonet. The three guide bushings for the drills, C, are contained in the cap. In operation, the screw D, held in block E, is swung clear and the work slipped into position with the screw holding it in place and the drilling is then accomplished in the usual manner.

Fig. 10 illustrates the method of milling out corners in groove, the locating points only being shown. The tongue is placed in block A, the blade resting on block B in the groove, on under side, and a clamp C binds the blade on top while cutting. This operation is done by vertical milling cutter in the form of a small end mill, the manner of using being obvious, as this tool cleans out the radius left by Fig. 7.

Grinding the Points

There now remains to be machined the point of the bayonet blade and a slight amount of finishing on the cutting sides. This is taken care of by grinding with the assistance of simple attachments for the grinding wheel. For grinding the point the blade is set in holder A, Fig. 11, and the latter is made to pivot at B. The point of blade is held lightly against a disc, C, mounted with grinding wheel, and is clamped in position with screw D. By swinging blade on pivot B the point is ground on a radius which tapers back to shape. The holder is adjustable at E to allow for wear of the grinding wheel.

When grinding the cutting sides the blade is passed back and forth across the face of the wheel with a slight twisting movement which gives the desired shape and completes the machining of the blade.

The making of this bayonet blade gives a good illustration of economical handling of a long slender bar of a complicated nature on the milling machine, one of the chief difficulties to overcome being the spring of the work, and as it has been necessary to dwell at some length on this part, the machining of hilt, guard crossing, and assembling will be taken up in another article, the assembling of the bayonet being treated in its relation to assembly or use with the rifle.

TURNING OUT CHEAP CASTINGS

IN foundry work, says the Foundry Journal, two classes of castings have generally to be turned out—those which have to be made of the best quality and to stand high tests irrespective of cost, and those which have to be produced at a moderate cost, and which have to undergo no tests, but which merely have to be sound. Possibly both classes may have to be made in the same foundry, but more generally this is not the case where castings are made by engineering works running their own foundries, as such places always specialize more or less.

Class of Castings Feature

When laying out a place where cheap output has to be dealt with, the class of castings produced will need consideration and this because there are means of reducing costs very considerably. Thus the use of moulding machines, false backs in hand moulding, and other things of this character cheapen labor in the making of moulds, while a coremaking machine reduces the cost where large numbers of cores of stock sizes are required. Besides such appliances as these there are also different things in regard to the sifting, mixing, and grinding of sand, carefully made flasks, and other items, tending to save time, so that having in view the class of work which is to be produced, by a suitable selection of the tools used in working, large savings can be made in the cost of the mould production.

As wages are a very important item in all classes of foundry work, it is equally important that everything should be done to make patterns and other details favor the moulder, because in many places more time is spent in mending and patching broken moulds than in their actual production, and this simply because the make of the patterns prevents a clean lift or draw being secured. The making of one or two extra flasks per day means a large reduction in cost of production, particularly where light castings are being dealt with.

Pattern Upkeep

Another point is to keep all patterns in good condition and well varnished, so that they do not suck the sand, for it will be found that, in all but exceptional cases, moulders appreciate good patterns. Apart from labor charges, fuel has to be considered, and a good foundry coke free from an excess of sulphur is cheaper than gas coke in crucible melting, because there is less weight per part of metal used on the one hand; again, crucibles burn out less on the other, sulphur being bad for plumbago crucibles.

Scrap Metals

Generally speaking, scrap metals would be used for cheap castings, and by careful sorting almost any class of castings can be produced. Take iron, for instance:—If galvanized stuff is kept out, rough scrap bought from itinerant collectors will take in everything from old machinery to soft iron, and from hard and burnt stuff to old saucepans and the like, some of the older material being good as new pig.

Brass and gunmetal, taken unsorted from the dealers, may be bought on an average far below what new metals would cost, and by careful sorting almost any class of castings can be produced. Even such stuff as small turnings, at a price, comes in well, but, of course, it is desirable that it should be passed through a magnetizing machine to remove iron. A good sorter will make a variety of qualities from a heap of mixed stuff, and will enable one to turn out almost any kind of cheap casting needed, even the poorest qualities having use. It generally happens with cast brass scrap that a fair proportion little better than brazing spelter is present; it may, therefore, usually be assumed that zinc is in excess. For this reason it is necessary to run down large crucibles where this is sorted out separately, and to use the metal for the lowest-priced castings. For the better work the rolled scrap will come in well.

Old-fashioned house bells should always be saved, as owing to their richness in tin, they work in well with gunmetal, provided they are not too freely added. As a matter of policy it is always well to use some good make of deoxidant flux with all scrap metals, because there is the ever-present risk of having paint or other objectionable foreign matter present with some part of the charge, and this may very well cause porosity. New metal should cast clean enough, but scrap is often awkward to deal with unless outside assistance is provided.

PROCESS OF COLD ENAMELING

THERE are many small objects whose beauty is much enhanced by the application of a coat of enamel, but which are not capable of being fired. A process of enameling these in the cold, so simple as to be quite practicable, is described in La Nature as follows: To a solution of sodium silicate, boiled in a closed vessel, there is added about 5 per cent. of sulphate of lime. This causes a precipitation to take place, the ulterior effect of which is to prevent efflorescences which would injure the looks of the enamel. The solution, after being once decanted, assumes the consistency of a paste which is heated to about 75 deg. C. to apply to the objects to be enameled. A second decantation takes place in the vitreous layer, and this then takes on an unalterable translucence. It may be tinted any desired shade, either in the mass or superficially, the colors being fixed by tannates of gelatine and alum.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

PIECE WORK SYSTEMS—I.

By R. R. Clarke.

THE economic principle of factory operation sanctions nothing that does not favor increased output at reduced expense. Every practice or change of practice in the system of all systems can be traced to this actuating desire. "More for less" seems to have been the slogan of the masters from the earliest dawn of the labor question down to the present and has been answered by the murmur "too much for too little already," from those whose lot it has been to serve.

While the world lasts, some will work: others be worked. Nor does this mean that any one class or either side has been doing all the work or suffering all the woes of the "being worked" class. Bright men sit at the desk but those just as bright work at the bench. Between them it is a big game of checkers, each side studying the board and planning its move, wondering all the while what the other fellow is going to do next. For this, corporation interests have banded and met their resistance in the unions of men; on the one side brains: on the other brains and brawn. Time has passed when trickery gains much. Something higher in principle, more honorable in conception must be substituted. Employer and employee must meet on grounds congenial to both. Advantages must be mutual or the party on the long end of the business chuckles while the other fellow kicks and squeals.

Piece Work an Equalizer

The piece-work system is in part a solution of the problem. In the foundry it is of special advantage. That it entails some evil we have no doubt, but that it yields benefits far in their advance we have as little doubt.

The most praiseworthy feature of a good piece-work system is that it places every man on his own resources and stamps him for exactly what he is worth. To the employer it offers increased production and protection against the careless, lazy, or indifferent workman, while it yields to the workman the advantage of increasing his daily earnings and applying his aptitude to his own profit. Yielding this dual advantage it appeals with reasonable attractiveness to both sides and offers a respectable avenue of escape from more than one difficulty.

It is, however, not without its difficulties. The setting of piece-work prices has a tendency to call forth many contentions between the foreman and the workman. In this the foreman's lot is, indeed, a hard one. Having his own conscience, the firm and the workman all to satisfy, his position is not always an enviable one. Determining bad work and fixing the blame therefor often brings coremaker, furnace-man, helper, moulder, foreman and inspector together in stormy seance. The system often superinduces in the man a tendency to dishonest practices, which from both a moral and business standpoint is a serious thing. It also favors development of a class of inferior workmanship due to what for want of a better we shall name the "hogging" instincts of the man. In fact our experience in this has been such as to strengthen the opinion that piece-work moulders are inclined to make castings just good enough to pass and very often insist on having their own judgment decide the issue.

Their disadvantages, however, all lie within the province of elimination, or at least satisfactory adjustment. That some have failed to realize such and decry the system in consequence is no conclusive evidence against it.

Necessary Conditions

We believe in the piece-work system, the equitable adjustment of piece-work prices and reasonable demands for high standards of workmanship in the absence of which the casting is scrapped and the workman at fault made to suffer the loss. We favor piece-work prices that will enable the honest and average workman to increase his daily earnings at least 25 per cent. over the day-work figure, such increase carrying with it the demand for nothing but merchantable castings. We believe in a just and trustworthy inspectorship, an equitable and competent inquiry into all circumstances and conditions to which the loss of the casting may possibly be traced, and the closing of all arguments with the decision that good judgment derives therefrom. At the same time we maintain that no workman should be made to suffer any loss arising from an error of judgment on the part of the management and deem no man fit for management who, to cover up his own error, would attempt to cast reflection on the workman, or attribute the loss of the castings to any other cause. That such a system will meet with opposition at its inception is a foregone conclusion, but a firm yet courteous determination will bring harmony out of discord and work benefits for all.

HEAT TREATMENT OF COPPER ZINC ALLOYS

By "Melter."

COPPER zinc alloys are generally considered by taking up the theoretical side of the constitution of the alloy which points, when gone into, have little practical value. It is of interest however before going further to note the effect of decreasing the percentage of copper and increasing the percentage of zinc.

Copper content per cent.	Tensile strength tons per sq. in.	Comparative malleability	Comparative hardness	Grain
79.5	15	7	15	Fine
75.0	13	10	14	Fine
66.0	12.5	3	23	Fine
49.5	9.2	12	12	Coarse

If the percentage of zinc is very low it generally will be found that the brass is full of blow holes and therefore unsatisfactory. It is not possible to work brass hot as the tensile strength becomes so low after 400° F. has been reached that the metal tears. In fact brass is so sensitive under shock at higher temperatures, say 1300° F., that if a piece be dropped, it will very likely be found to be defective. The period of annealing does not affect the structure much until 1300° F. has been reached when it has been found to greatly weaken 30-70 brass if held in the oven too long, say longer than 45 minutes.

The most important factor in annealing brass is to anneal at the lowest possible temperature to get the required elongation. Tensile strength increases with annealing temperature up to 550° F. when it falls off with gradual increases in elongation.

Effect of Annealing

If the tensile test pieces are examined when the annealing has been done at a high temperature it will be found that the surface is roughened demonstrating that the grain size is too large and that there are cleavage cracks between the crystals. Microscopic examination shows that at about 750° F. annealing temperature brass begins to have enlarged grains and at 1380° F. the size of grains is about at the maximum allow-

able if any commercial use is to be expected from the product. A glance at the figures showing strengths and elongations at varied annealing temperatures will confirm the above.

TEST OF 30-70 BRASS

Temperature Degrees Fahr.	Maximum Stress tons per sq. in.	Elongation in 2 in. %
...	25.0	15.5
515	28.5	20
662	26.2	30
932	18.2	54
1166	17.0	58
1256	16.5	58
1382	16.0	63
1475	15.0	59
1560	15.0	59
1650	14.0	53
1690	13.0	25

Quenching brass has been found to give very little difference except in the elongation but the results obtained do not warrant any adoption for commercial practice. Annealing then should be carried out at from 1200° F. to 1300° F. with a period of 30 minutes at that temperature and great care should be taken to heat uniformly and not to subject the brass to shock or strains at that temperature.

PURCHASING LARGE MACHINERY

IN a paper read before the Mechanical Section of the Engineers' Society of Western Pennsylvania by G. A. Orrock, mechanical engineer, the New York Edison Co., it was pointed out that two methods have generally been employed in purchase of large machinery.

In the first and what has been called the English method, the purchaser's engineer prepares detailed plans and specifications on which bids are taken in the customary way, an award is made and the successful bidder builds the apparatus. He may or may not be responsible for the results. If he is responsible for results, he is usually allowed to vary the details to some extent.

The second method has perhaps been more used on this continent. Here the purchaser furnishes a specification setting forth the conditions of the problem, the end to be sought and certain sizes to be observed. He also specifies an economical performance to be reached and to be guaranteed by the contractor. There may or may not be a bonus and penalty clause for performance, also provision for an economy test. Bids are taken on this specification and an award made. The successful bidder builds the apparatus.

Faults of Both Methods

Both of these methods are faulty. The first leads to excessive cost and the perpetuation of fads, to higher maintenance; the economies as a general rule are not so good as they might be. The second method usually secures a machine not quite fitted for the work, high maintenance and undesirable operating costs, and a set of constructional details adapted from some other type of apparatus. The economies may be up to guarantee and usually are, but the over-all economies are not bettered in the way they should be.

The second method has more vogue here because the control is more largely financial than technical, and the tendency is to let experimenting be done by others. Here the responsibility for design and results is put up to the contractor and the apparatus is never quite up to the state of the art, as he too will not use his latest knowledge to any extent. He will use all the well-tried devices, will make small economies everywhere and meet the guarantees, but his latest knowledge will be reserved for the second or third proposition beyond this one.

Under the first method much good work has been done, but the scrap heap has been enlarged much more under the second method. The chief advantage is secured where the purchaser's engineeer is unhampered in his design, always stipulating that he is a high-grade engineer with few fads and a broad acquaintance with the art.

Combination of Methods

The best results may be secured by a combination of the two methods, bearing in mind that the best engineering is one man's work, although he should have many advisers. The purchaser's engineer prepares a skeleton specification with certain plans and details on which proposals are selected as being the best, and a series of consultations take place in which the entire problem is gone over in an engineering way, with the engineers of each bidder. During these consultations the specifications may have undergone changes and been added to until it is no longer a skeleton, and at the end the selected bidders make their final proposal.

Sometimes only one bidder might be selected, or it might even be found necessary to start all over again. Frequently it has been found necessary to go outside of the regular line of contractors on a certain line of apparatus in order to get the required results, and more frequently improvements and means of economies must be brought to their attention and the adaptability of well-known types of apparatus in other fields suggested to them.

I have known cases where the entire plant was detailed in the engineer's office. A saving of 50 per cent. in the operating cost was attained and similar economies have been reached by using contractors' designs, but these cases are usually exceptional or occur in remodeling old plants. With the combination method economies of 10 to 15 per cent. have been readily secured in first-class plants, being at the time perhaps all the state of the art would allow.

Forcing the Manufacturer's Hand

Manufacturers' representatives frequently say, "We do not care for that kind of business; our shops are full and it upsets our work; we cannot afford to touch it." The answer invariably should be: "You can't afford to pass it by, even if you should take the business at a loss, for some one will take it, and if the economies are sufficient you will have to build it in the end and pay them for the privilege."

The position of the engine-building shops 15 years ago and to-day well illustrates this phase of the subject. It is not, perhaps, too much to say that many of the great steps in the engineering arts have come with the purchasing of large machinery by the last plan. In the early days of the electric-lighting industry Mr. Edison, looking ahead as he always did, designed his largest generator for direct connection to a high-speed engine. The Jumbo units installed at the old Pearl Street Station in New York were the result. Standardization, however, made the belted plant common and almost universal. It was a common practice to put two flywheels on a 500-h.p. high-speed engine, and, running double belt on each flywheel, to connect four 62-k.w. generators to each engine. I am credibly informed that a station with 10 such units was in operation within two years.

Engineering purchasers finally brought the multi-polar machine and the engine into direct connection, which resulted in the so-called heavy-duty type of frame. The use of the centrifugal pump for boiler feeding was forced on the manufacturers, who much preferred to furnish the standard article. Again, in the fields of mining and metallurgy there are many illustrations. The handling of material, cleaning of gases, types of furnaces, introduction of new processes, all bear evidence that this third method has been long used. The early development of the open-hearth furnace, as told by S. T. Wellman, illustrates the taking advantage of the best talent available in the design and purchase of large machinery, and the development of the rolling mill has been the product of both the purchasers and contractors' engineers in consultation.

Conclusions

In this era of change and progress engineers interested in large machinery should keep closely in touch with contractors' engineers and with the state of the art in other industries. The results of a small experimental machine in one industry may set the pace for a great step in another widely different industry.

The purchaser of large machinery must be broad, as is consistent with his knowledge, of judicial mind, reasonably quick in decision and with as wide an acquaintance with the art as possible. Such an engineer will not take up fads, will know within reason what his limits are, and will not be frightened by cost in block, knowing that it is cost per unit of output that counts in the result.

G.T.R. Apprentices at Stratford Shops are Again Winners

Contributed

The object of an apprenticeship system is to provide a supply of well-trained mechanics, foremen, and staff officers who can be relied upon to go ahead with and carry out efficiently and successfully productive work in a particular sphere of manufacturing and industrial enterprise. It has been found from experience that men so trained become not only a valuable asset to those directly concerned, but are an important contributory factor in the matter of that higher standard general competence, so necessary to manufacturing achievement.

IN the Grand Trunk Railway System, and particularly the big shops located in their midst, the citizens of Stratford take a just pride, and the enviable reputation which the apprentices have secured and maintained from year to year at the annual examinations held by the company, bears striking testimony to the capable work of the master mechanic, Robert Patterson, and the local instructor, M. A. Humber.

Thirty-five Don Khaki

The Stratford shops apprentices have 35 of their number on various units of the Canadian overseas forces. Some of them are now fighting in France, doing their bit for the Empire and Canada. Another 35 are engaged on shell work, also doing their bit by helping the boys at the front win their battles. In spite of this drain on their personnel they have again been able to take first prize at the apprentices' annual competition over the entire Grand Trunk System, having obtained the highest average combined marks for drawing and mathematics. For a number of years apprentices at other stations have been unable to wrest this honor from Stratford, and not only do the boys themselves feel proud of their achievement, but all employees at the shops and the citizens generally are glad to know that the boys have again kept their reputation.

Swept the Prize Board

At a meeting held in the Assembly Hall, on April 27, the master mechanic, Robert Patterson, presiding, the boys were congratulated on their success as a class and the three individual boys, named, A. Anderson, 1st year; A. McDowell, 4th year, and W. Davis 3rd year, who took three capital prizes out of the five given for competition for apprentices all over the railroad system. Mr. Patterson informed the apprentices that they were all to receive a substantial increase in their rates. This will enable apprentices who come to learn a trade and have to support themselves, to do so comfortably, and should prove a great incentive for boys to come to the Stratford shops and not only have the advantage of learning a first-class trade in all its parts, but also receive a training in mechanical drawing and mathematics during their apprenticeship.

Graduates Hold Good Positions

Stratford is particularly fortunate in turning out a large number of young

THE APPRENTICE CLASS OF 1915-16, G.T.R. SHOPS, STRATFORD, ONT.

First row (left to right)—W. Hayter, C. Smith, J. Meeks, E. Marks, F. Bowra, A. Wilhelm, C. Wilbee, J. Earnshaw, M. McDowell, C. Gibson, J. Hagarty, G. Richards, J. Gaunt, G. Mellors, A. Jeffries, F. Herod, F. Flaherty, M. Schaefer, G. Grandy.

Second row—C. Shaw, C. Pepper, R. Andrews, T. Durney, S. Devlin, F. Wilson, V. Swansen, F. Rutherford, F. Tuthill, W. Schultz, D. Sproat, A. Keep, F. Mitchell, P. Barclay, R. Ord, C. Hubbard, E. McPhee, V. Murphy, F. Salisbury.

Third row—A. Lewis, W. Krug, F. McIntee, W. Flanagan, G. Barrett, E. House, R. McTavish, W. Edwards, E. Kneitl, J. Blum, A. Townsend, B. Wilson, D. Humphrey, B. Dyer, W. Montgomery, H. Farrow, G. Marks.

Fourth row—T. Flin, H. Thorn, C. Searth, A. Anderson, J. Mellors, C. Campbell, E. Huegli, W. Fraser, W. Burrows, S. Sheard, G. More, H. Servent, W. Brown, G. Ewart, L. Clarke, H. Harefeldt.

Fifth row—J. Flaherty, A. Capper, H. Rowland, L. Day, D. Davis, A. McKenzie, F. Isaac, S. Bruickner, A. Graff, C. King, E. Campbell, E. Wilhelm, W. Grandison, W. Furey.

Sixth row—H. Brayne, R. Sillifant, G. Maynard, — Wilhelm, G. Dinan, W. Keep, T. Pollard, R. Clarke, A. McDowell, A. McPhee, J. Black, V. Copeland.

Seventh row—B. Wilson, S. Tuthill, L. Abbey, G. Allan, F. Given, O. Osborne, L. Dempsey, C. Schellenberg, F. Taylor, A. Fraser.

Eighth row—W. Shaw, R. Huegli, L. Waddell, J. Rutherford, W. Schaefer, J. Wingefelder, A. Dickson, P. Chesney.

Ninth row—H. Jones, G. Gilbert, E. Davis, F. McInnis, H. Schultz, G. Salisbury, J. Day, J. McArdle.

men who are now holding good positions on the Grand Trunk, other railroads, and in manufacturing establishments. The idea actuating the management is to secure the right kind of boys in the first place, then look after them during their apprenticeship. Not only do the apprentices at Stratford receive these advantages, but they also hold a correspondingly good social position in the community.

Value of Industrial Classes

Just here we might mention, the many advantages of the industrial classes at Stratford, which are supported by the Government. Boys who have to leave school earlier than usual and cannot pass the entrance examination to become apprentices in the shops, attend the night classes regularly and receive sufficient education to enable them to enter later as apprentices, large numbers of these being taken on at the works as probationers.

The apprentices have always been accustomed to hold an annual banquet. This is not altogether an affair of pleasure, being usually of an educational nature in addition. These banquets are held at all the large stations on the G. T.R. system, and a couple of apprentices are sent from each station to represent their own local centre. W. D. Robb, superintendent of motive power, is always present at these functions, and as he devotes considerable personal attention to the instruction and welfare of apprentices in the motive power department, and is much interested in their progress, what he has to say is usually along the lines of encouragement and stimulation to increased effort.

A Proud Record

The apprentices at Stratford have not only taken the first prizes for several years in the apprentices competition on the Grand Trunk System, but have also taken a number of prizes for several years for mechanical drawing at the Canadian National Exhibition, Toronto. The reputation of the apprentices at Stratford shops is so well known and the advantages accruing to those who enter employment there that apprentices have come from all over the continent even as far as China, two of these boys (sons of English parents) having come to Stratford to learn a mechanical trade. Apprentices include sons of doctors, lawyers, members of parliament and prominent railroad men.

Railway Men Responding Well

At the meeting referred to, it was pointed out that over 400 Grand Trunk employees, including 35 apprentices have joined the overseas service. The staff of employees at Stratford contributed a large portion of the bandsmen for different battalions, and a number of well trained first aid men, while a number of those who enlisted have since risen to positions of officers in the different battalions. Considering this the apprentices by resolution thought that they should forego their banquet this year, although it would be some sacrifice to do so, and decided to grant $50 to the Daughters of the Empire to assist in providing comforts for the soldiers who went and are going overseas. This is the second donation which the apprentices are giving, the first being for $100. When it is realized how much the boys appreciate their annual banquet and the great pains they took to make it a success, it makes the action taken all the more commendable.

As they have again won the first place on the System, Mr. Patterson promised them that they would have their annual excursion as usual. They have had this excursion for a number of years and enjoy the outing. Last year on account of the strenuous work in the munition department the apprentices there were not able to go.

ROBERT PATTERSON,
Master Mechanic, G.T.R. Shops, Stratford, Ont.

HIGH SPEED STEEL SCRAP

Arrangements have been made by the British Ministry of Munitions whereby the makers of high-speed steel will take back all scrap, short ends, etc., at uniform prices. The prices which have been fixed are:—10 cents per pound for turnings, and 12 cents per pound for bar ends, delivered at steelmakers' works. All material of this kind is to be returned as far as possible to the manufacturer who supplied the original steel. In cases where this is not possible, owing to supplies being obtained from a number of manufacturers, the scrap should be returned in proportion to the quantity of steel which was originally received. The scrap must be packed in convenient-sized barrels, or other suitable cases, and should be free from all foreign substance, and particularly other kinds of steel.

Turnings should be returned as soon as a reasonable quantity can be got together and not kept until rusted solid; such scrap is practically worthless. Under the regulations published in the 'London Gazette,' dated March 3, as 30 B of the Defence of the Realm, Regulations, it is illegal to dispose of high-speed steel through any but authorized channels, and users are therefore advised that the above arrangements should be carried out in every case.

INDUSTRIAL GAS

LECTURING recently before the Derby Society of Engineers on "Industrial Gas: Its Services to the Nation," H. M. Thornton described some of the many ways in which the gas industry is contributing to our efficiency in this time of war. The heat treatment of shells, he pointed out—a matter of vital interest to national existence—is largely carried out by gas furnaces, the even, reliable easily regulated heat of which is very valuable for such important processes. Some of these furnaces are comparatively small, but others are capable of annealing or heat-treating ten 15-in. armour-piercing shells at a time. Gas furnaces are indispensable for various processes in the production of 18-pdr. shrapnel shells and of 4.5-in. and 6-in. high-explosive shells, and are also used on a large scale for annealing the brass cartridge cases and the copper bands of shells.

Finally, in this connection there is the drying oven and trolley. Gas burners are placed around the bottom side of the oven, and trolleys of different shapes and dimensions are specially constructed to take the desired number of shells. The shells have to be dried in order to harden the varnish placed in the interior and thus prevent any chance of oxidation from the steel if the shell is kept in stock some time. This condition, however, said Mr. Thornton, is not one likely to be experienced, as we hope to "deliver the goods" with promptitude into the German lines.

A well-known Melbourne manufacturer received a contract for the Defence Department for a large quantity of entrenching tools, and in lieu of the ordinary imported steel he obtained steel produced at the Broken Hill Proprietary Company's works at Newcastle. He is now making what is most likely the first article of military equipment (except shell bodies) manufactured entirely from Australian raw material.

Power Driven Machine Tool Equipment on Board Ship*

By J. H. Thomson

While a regularly constituted workshop, more or less extensively equipped with machine and hand tools and appliances, is far from being a novelty aboard ship and more especially so in the case of the larger size war vessels, the fact remains that little progress has been made in the direction of providing merchant ships with at least a modest installation of power-operated apparatus that would successfully cope with a large percentage of the repair and overhaul work incidental to sea-going service. The subject matter of this paper makes evident that a power-driven machine tool equipment is worth while for many reasons.

It might be thought that in the present age of machinery, there would be little need to plead for up-to-date power-driven tools for executing the everyday mechanical work on board a modern steamship, yet the majority of ships will be found deficient in this respect, many possessing no power-tools whatever, others only a nondescript lathe put on board with considerable disregard of the probable requirements, size of ship, etc., and of the large range of work which can be economically carried out, if given suitable and suitably equipped tools.

Any repair that can be efficiently carried out on board ship, by the ordinary staff, without entailing the neglect of other duties and without entailing any overtime work, will cost considerably less than ashore. The enormous saving in time would in some cases avoid the ship being detained in port, and owing to the quickness and ease with which work can be done, the machinery will be kept in better repair, as the ship staff will have more time to devote to it.

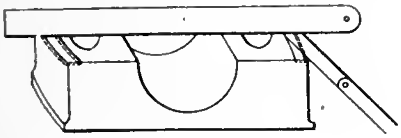


FIG. 1.

Stripping a Bearing

To take a simple illustration of everyday routine work:—Suppose a 3 in. diameter by 2 in. wide bearing wants stripping, the amount of metal to be removed—ascertained in the usual way by leads—is 25-1000. It could be put in the lathe, the amount required taken off to within 1-1000, a true plane surface left, parallel with the opposite plane surface of the bearing, or parallel with the bearing itself as may be required, sharp edges and rags removed—all in well under a half-hour, with a minimum of physical labour by anyone with a slight knowledge of turning.

In the vise, with a good file, the same job would take from an hour to an hour and a half and given a good tradesman, he might have the required amount off to within 3-1000 and in that time have an approximately plane surface, nearly parallel with the other surface of the bearing. With a poor tradesman however, there might be 5-1000 or more of error in the parallelism of the two surfaces. It should further be remembered

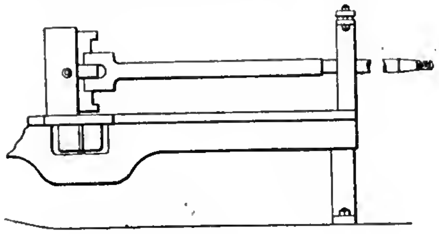


FIG. 2.

that such a job has often to be carried out in an engine-room at a high temperature. Doing the job in the lathe is more or less a pleasure to the engineer, and he is practically as fresh after its completion as he was before he started. Doing it in the vise is mere mechanical drudgery, and the engineer is wet with perspiration, and has lost a considerable amount of energy.

A simple method of taking off exactly the right amount of metal in the lathe might be given. Face up only about a quarter or less of the surface to be stripped, until, when laying a good straight edge across the old surface, the required feeler will just slip in between the straight-edge and the new surface, after which the remainder of old surface can be faced down to the same plane (see Fig. 1).

As illustrating a common repair, the valve-spindle of a steam stop-valve is

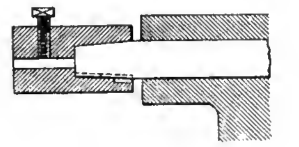


FIG. 3.

broken on the day of sailing. With a power-driven lathe on board, and a small stock of various sizes of brass rod, such a spindle could be replaced in about four hours, possibly less if it so happened that there were any old valve-spindles on board which could be worked up for the job. Without a lathe and with the necessity to send the spindle ashore to be made good, the time lost may be anything from a half-day upwards.

Equipment Minimum

The minimum power-driven tools advocated on board a ship are a lathe, a drilling-machine, and a high-speed grinder. These tools should be so arranged that each can be in use simultaneously. It will be most convenient if the three machines are grouped together, so that all may be driven off the one counter-shaft, fitted in the usual way with driving and loose pulleys. For driving the counter-shaft an electric motor complete with starting switch, etc., will be required, the power of the motor depending upon the size of the tools that it is proposed to instal; one of 2½ horse-power should be ample for all ordinary requirements. A point which might be considered is whether the motor might not be fitted so as to be capable of assisting the lathe gearing in getting the required

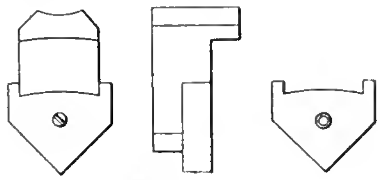


FIG. 4.

slowness of speed for turning a job of large diameter; such a job being of infrequent occurrence, there would be no objection to running the countershaft temporarily at a reduced speed. Getting the lathe to revolve slow enough is sometimes a bit of a problem on board; it can occasionally be solved however, by running the dynamo at a reduced voltage.

The Lathe

It is difficult to fix definitely the size of the lathe that should be fitted on board ship, and the point should be one that will bear discussion. The suggestion is put forward that the aim should be to have a lathe which, with the gap removed, would be capable of dealing with the high pressure junk-ring, the high pressure piston being the one which usually gives the most trouble from wear, etc. The length should be capable of

*From a paper read before the Institute of Marine Engineers recently.

dealing with any of the main-engine valve-spindles, not that it is thereby implied that the valve-spindle should be accommodated between the lathe centres. It will generally be sufficient if, by the aid of a fixed stay (Fig. 2), that part of the spindle which works through the neck bush, stuffing-box, gland and guide are capable of being efficiently dealt with.

Space in a ship for a lathe of such size is not always obtainable, but with a little contriving it should be managed, except in very small boats where the length may require consideration. A suitable position in a turbine-driven ship is often found in the shafting compartment which usually extends right across the engine space; there the lathe, drilling-machine, and grinder can be ranged along the ship's side, using the ship's frames for the purpose of attaching countershaft brackets, motor, etc. The forward starboard side is usually the more suitable, thus leaving the ends of the shears clear for any extra long job to overhang, this point should also be kept in mind if the lathe is placed in the engine-room, as one often sees the end of the shears close up against the ship's skin, which renders the turning of a long job impossible.

If the space is so limited that the end of the shears cannot be left clear, then they may abut on a hold or bunker bulkhead, which can have a circular hole cut in it in line with the lathe centres, such hole being made water-tight with a covering plate. This means that a time must be selected for doing any job which is extra long, when the bunker is clear of coal, or the hold of cargo. It may be mentioned that such a hole, by bolting a suitably shaped piece of wood to it, may be utilised as a fixed stay.

There is one point that must on no account be lost sight of in selecting a position for these tools. The space selected must be well ventilated, and cool enough at all times, even with steam on the main engines and the ship in the tropics, for a man to work in comparative comfort. The speed at which the ship's lathe can be driven requires more consideration than it usually gets; for seeing that there is only the one machine, it stands to reason that it should be capable of a very much larger range of speed than would be the case in shop practice. Thus, if the suggestion that the lathe should be capable of dealing with the junk-rink be accepted, then it follows that the lathe-spindle should be capable of being driven from a speed suitable for turning a small-diameter brass pin; and if the suggestion made later-on regarding the supplying of one or two emery wheels for use in the lathe be carried out, then the lathe-spindle should be capable of a higher speed still—say 1500 revolutions per minute—which is suitable for a 14-in. diameter wheel.

Cutting Screws

The ship lathe must be capable of cutting screws of all the standard pitches, and it may require to have one or two odd wheels for bastard pitches, if the engine-builder happens to be one of those who use bastard threads—a practice resorted to in order to compel the user to come back to the maker for renewals. The usual compound saddle-rest is required with cross-feed, etc. Quadrant should be marked off in degrees. The moving head-stock should have a cross-adjustment for purposes of alignment or turning up tapers.

A suggested fitting for the moving head-stock which would be of great use is a drill-chuck. This would be attached to the moving cylinder of the head-stock, the boring of holes in work which is attached to the running spindle being of much more frequent occurrence than of that in which the drill is attached to the running spindle. Drills are sometimes supplied capable of being placed in the taper hole which holds the fixed centre or a special drill-holder; but the practice is not good, as the hole gets damaged, and so renders the fixed centre shaky or out of alignment. A suggestion for a holder is given in Fig. 3, which is self-centring and free from shake, and can be detached by drawing in the cylinder by means of its screw, when the holder will abut on the barrel, and be forced off; a sunk feather is fitted to the holder, engaging in a keyway on the under side of the cylinder end.

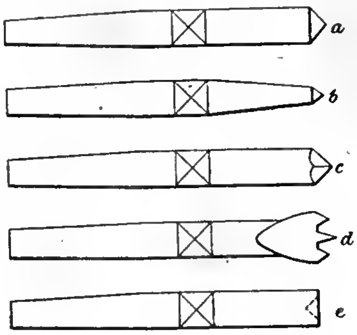


FIG. 5.

The attachments for the running spindle will consist of:—One large face-plate for use with gap removed; one face-plate for use with gap in place; one driver-plate for driving work held between the centres; and one chuck with four independent dogs, each having three steps, and capable of being reversed, and holding circular work securely when they are so. A shortcoming of most dogs is that they will not very readily catch small work, say, of 1/4 in. diameter.

In Fig. 4 is shown an attachment which will be found useful in this connection. Any one wishing to adopt it should make a wooden pattern a neat fit for the dog, and get four forged off it in tool steel; then true up one flat surface of the forgings and fit them to the dogs, making sure when boring the holes and fitting the pins that the strain when screwing up the job will not come on the set-pins. The set-pins will last better if they are also made of tool steel.

After the forgings have been fitted to the dogs, true up the sides of the V-shaped portion until the four points meet in the centre of the plate. The dogs lie in a true circle, and the sides of the V-shaped portions form true radii of a circle. The front faces of the segments may be faced up with the chuck running on the lathe spindle. The V-shaped portions should not come to absolute points, but be left about 1-16 in. wide; a small rack, consisting of a piece of 1/8-inch plate with four tapped holes to take the set-pins, is desirable to hold pins and segments when not in use.

There should also be supplied one drill-chuck which will hold the drills supplied to the ship; this may be one of the numerous small self-centring grip chucks, or a chuck with a plain parallel hole, say 5/8 in. in diameter, if the drills are, as is very common, forged from 5/8 in. round tool-steel bar; one fixed stay, which can be bolted down to the lathe shears; one running stay, which can be attached to the saddle—those with adjustable metal dogs are more useful than those requiring the fitting of various size wooden blocks; one hand-rest for wood-turning tools.

Fig. 5 shows the lathe centres required. These consist of two ordinary pointed centres; one ordinary pointed centre with end of reduced diameter for small work; one cutting centre; two or more driving centres for wood-turning, and one hollow centre (optional). A list of tools follows, those being of ordinary form, 1/2-in. or 5/8-in. square-section of common tool steel, this latter being selected, as the many special self-hardening steels require an experienced tool smith to deal with them. Tools made of such steel could be dressed ashore, but there is always the possibility of them getting broken when away from port and requiring to be redressed by the ship's staff.

The Acting British Consul at Helsingfors, H. M. Grove, reports that, with a view to saving expense and trouble, nearly all the Finnish paper mills have decided to become members of a society which has been formed mainly for the purpose of buying in co-operation raw materials for the various mills, such as sulphurous earth, china clay, chlorate of lime, calcium of soda, glauber salts, limestone, lime, resin, sulphur, lead, hoop-iron, iron wire and jute cloth.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

1 IN. X 7 IN. SCREW MACHINE

THE accompanying illustration shows a 1 in. x 7 in. screw machine equipped with automatic chuck and bar feed, having a capacity of 1 in. dia. bar stock through the chuck and a maximum distance from the end of spindle to turret of 15 in.

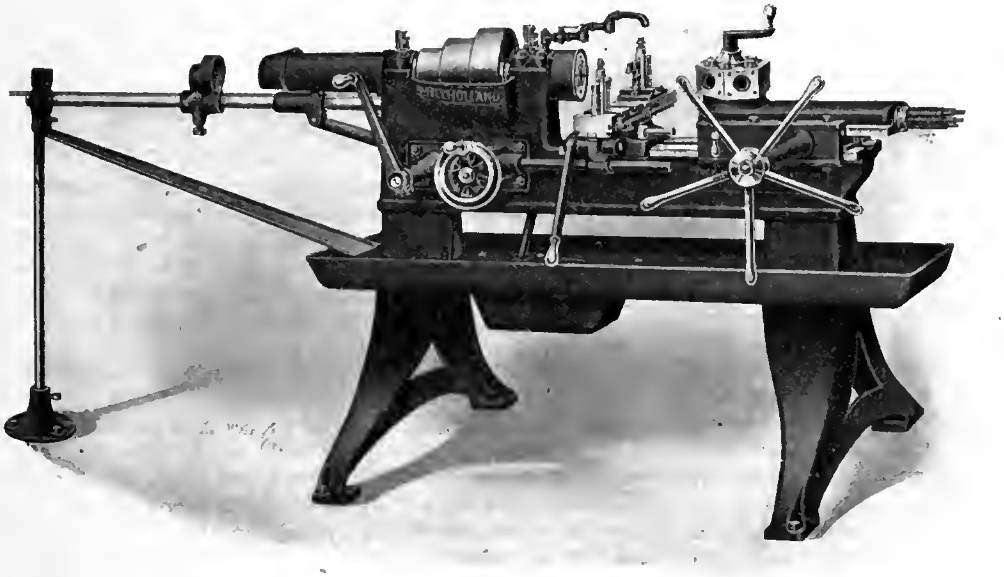
The headstock is cast solid with the bed, which is of ribbed box construction, the front and rear spindle bearings being tied together by side walls, which enclose the lower half of the cone pulley.

A high carbon steel forging forms the material for the spindle, which is finished by grinding, and is carried in die-cast bearings of large dimensions, provided with sight feed oilers. By a single movement of the lever in front of the headstock, the operator opens the chuck and feeds the bar while the machine is running. Slight variations in the diameter of the stock are automatically compensated for in the construction of the chuck.

The cut off slide is gibbed to a flat bearing on its carriage of ample size to insure rigidity under forming and turning cuts. By means of adjustable clips on a large diameter dial, it is possible to duplicate different shoulder lengths accurately with the hand longitudinal adjustment.

The turret, which may be either solid or hollow, is automatically indexed by the backward movement of the slide. The stud on which it revolves is tapered and is adjustable for wear; it is also bored so that long stock can pass through the turret and allow the use or short stiff tools. A pressed steel oil pan is fitted to the legs with complete lubricating system for cutting compound.

The W. K. Millholland Machine Co., Indianapolis, are the builders of this machine, some of the principal dimensions being: Swing over bed, 13½ in.; over-cut-off, 6 in.; cut-off feed, transverse, 5½ in.; longitudinal, 9 in.; holes in turret, 1¼ in. dia.; hole in spindle, 1 9-32 in. dia.; weight net, 1,275 lbs.; crated, 1,450 lbs.; boxed for export, 1,650 lbs.



1 IN. X 7 IN. SCREW MACHINE WITH AUTOMATIC CHUCK AND BAR FEED.

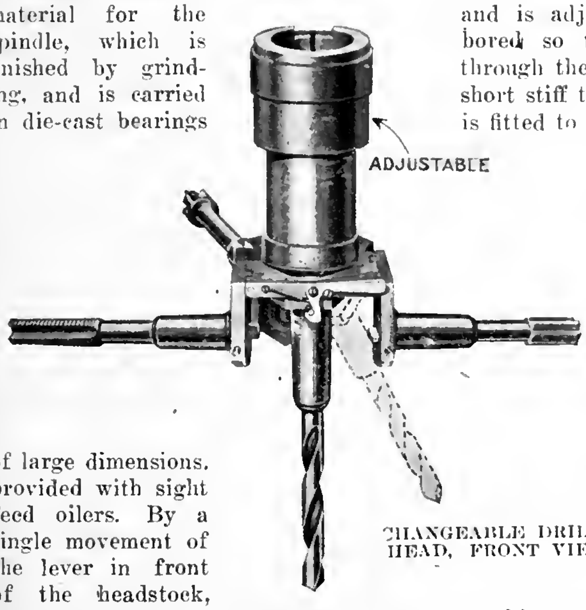
CHANGEABLE DRILL HEAD

THE accompanying illustrations show a changeable drill head, by means of which any one of four tools may be brought into use when required. The device consists of a sleeve which is clamped on to the lower end of the drill spindle sleeve, and which is provided with four swinging flanges, which support the tools as shown.

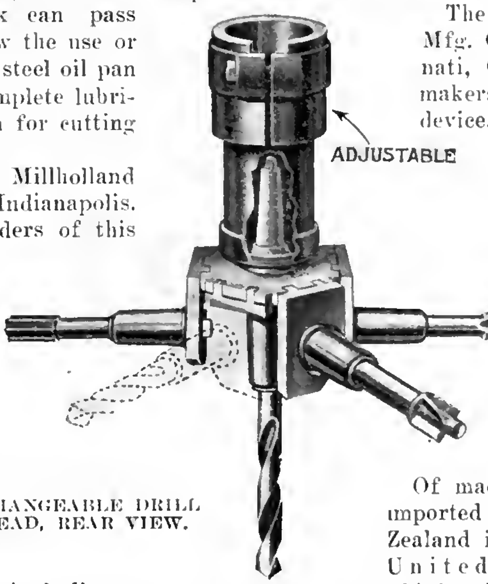
When one of these flanges is swung into position below the drill spindle, it engages with a socket driven by the drill spindle. When finished with, the tool is released by moving a catch shown on front view, when it swings out of engagement, allowing another one to be put into operation similarly. The drill head with the idle tools remains stationary, but is fed up and down by the sleeve on the drill spindle to which it is fastened.

When necessary, the sleeve in the head can be easily removed and bored out to suit any special machine; the standard hole supplied is 1½ in. dia., and two sizes of head are made with Nos. 2 and 4 taper shanks.

The Newman Mfg. Co., Cincinnati, O., are the makers of this device.



CHANGEABLE DRILL HEAD, FRONT VIEW.



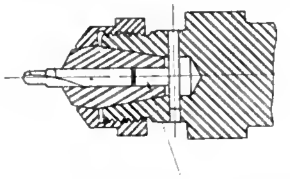
CHANGEABLE DRILL HEAD, REAR VIEW.

Of machine tools imported into New Zealand in 1914 the United Kingdom supplied nearly two-thirds; the remainder was shared by the United States and Germany.

FUSE RING ROUTING MACHINE

AMONG the many important operations necessary in the manufacture of fuses, that of routing grooves in the fuse rings is one of the most important, and calls for a high degree of accuracy. The universal horizontal routing machine illustrated was designed solely for routing fuse rings, and is built by the George Gorton Machine Co., Racine, Wis.

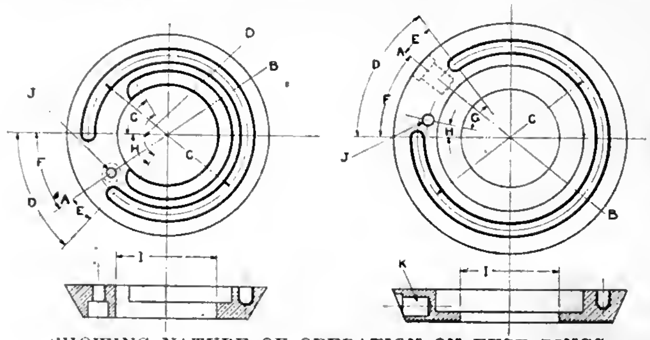
Among the most important features are the various adjustments which can be had, as illustrated by the requirements of the fuse rings shown in line drawing. Dimension C may be anything up to 4 in., angle D may be from 0 to 360 degrees, gauge holes may be in any position on top, bottom or side of ring, and distances E, F, G, and H are adjustable. Varying diameters of centre hole I necessitate the use of different plates



DETAIL OF ROUTING TOOL AND CHUCK.

made of hardened and ground steel, on which the ring is clamped by means of a drop forged fork and hardened cam.

The cutter spindle runs approximately at 3,200 revs. per min., and is carried in ball bearings mounted inside a sliding sleeve, which is clamped by means of a heavy yoke to another similar sleeve. The spindle pulley and the loose pulley are arranged together in the space between the sleeves, the whole being carried in two large bearings forming part of the frame. A simple type of spindle



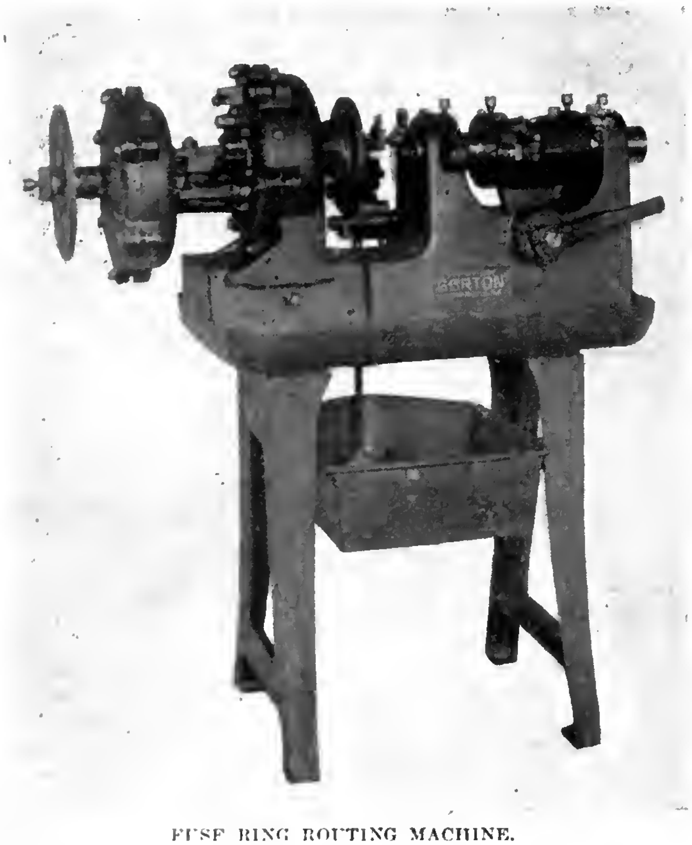
SHOWING NATURE OF OPERATION ON FUSE RINGS.

collet is used, which permits easy changing of cutters, uniformity in length of cutters being an important point.

In order to obtain good work the cutter should not project more than the minimum of 3/8 in., under which condition the groove is finished smoothly and accurately with one cut, and a production of 25 to 30 rings per hour can be maintained.

Stops are all made of hardened tool steel, and operate inside of the work holder case. The feed pulley is mounted on rear case and operates the work holder by means of two pairs of reduction spur gears. The work holder bearing is of a patented type, which runs in oil, is quickly adjustable and eliminates all vibration in the work. A complete cutter lubricating system is furnished except when machines are used on a bench and operating details are simplified, so that one operator can run three machines.

The complete machine weighs 810 lbs. net, and 900 lbs. crated.



FUSE RING ROUTING MACHINE.

STEEL CO. OF CANADA OUTLOOK

THE annual meeting of the Steel Company of Canada, held at Hamilton on April 25, was featured by important addresses by C. S. Wilcox, the new chairman of the Board, and Robt. Hobson, the new president. Mr. Hobson took a decidedly optimistic view regarding the outlook, even after the cessation of the present large contracts for munitions. Mr. Hobson, in dealing with the conditions that would likely prevail after the close of the war, pointed out that he did not want to assume the position of being a prophet, but there were conditions that warranted an optimistic view being taken. For a number of months after the war readjustments would have to take place, but once those were effected, good business should prevail for the steel companies. In this connection he pointed out that the railway companies were again coming into the market and were realizing that there would likely be a shortage of steel in 1917.

Mr. Hobson announced it had been decided to instal three new open hearth furnaces, which would increase the production 400 tons per day. "We have shipped nearly four million forgings for shells and blanks for high explosive shells, and would say that we are away ahead on delivery of everything asked of us by the Imperial Munitions Board."

C. S. Wilcox, the new chairman of the board, referred particularly to the finances of the company. He said in part: "As to the future, we must remember that conditions are not normal, and while business is satisfactory now, the directors and officers have serious problems to consider for the future. The cost of manufacturing has materially increased, prices for war munitions have been reduced and the Government has imposed a tax on our war profits, the amount of which cannot now be determined. This year we will have a steel production much larger than we have ever sold before, and it may be advisable for us to put in additional finishing plants at some points to take care of this extra tonnage."

Adjustable Bench Heights.—Production may be facilitated by having a bench the height of which may be adjusted. In the cleaning room the output of the grinders is increased many per cent. by providing them with stands which can be raised or lowered at will. The lowest level enables the castings to be tipped on and off easily, while the higher levels bring pieces up to a point best suited to the height for working of the individual grinder. Width should be considered from the human angle. Extremely wide benches may furnish large capacity, but they entail laborious reaching; moreover, invite the use of the rear part for the storage of odds and ends.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS, H. C. FOGARTY.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. MAY 4, 1916 No. 18

GENERAL BUSINESS, SHIPPING AND SHIPBUILDING

INDUSTRIAL conditions continue to show steady improvement, the immediate and future outlook being, generally speaking, such as to engender and foster optimism. Canadian business enterprise is perhaps on a more stable basis than at any time in its history, and is marked by a caution that augurs well for its permanent maintenance in that respect. While the possibilities of developing an export trade have been fully realized for many months now, we have only recently taken active measures to get into touch with it, a circumstance, however, that is in no sense indicative of tardiness, but rather expressive of the already-mentioned caution and desire to fit and adapt ourselves to one or more of the trade opportunities that the war has made available.

In this connection it may be stated that not a few of our steel mills and allied enterprises are already taxed to the limit of their capacity on export business, the latter embracing practically every country in the world with the exception, of course, of enemy countries. The effect in these instances has been to create a commodity scarcity as regards domestic requirements, and have the natural consequence of causing increased prices in the latter sphere. However, if the export campaign as it develops intensity, works out as successfully as anticipated, it will not only lead to the maintenance of a favorable trade balance after the war is over, but will offset any tendency to a reactionary period which might be expected to set in immediately peace is declared.

The steel market, which after all is the real barometer and foundation of the industrial activity of this or any country, continues to maintain strength, the demand for steel being as insistent as ever. Our own mills as well as those of the United States have all the business they can handle for this and a large slice of next year, and, in saying that much, we are far from straining the situation. A shortage of labor is the meantime bugbear, and the immediate outlook is that manifestation of the latter may become more aggressive. The upward price tendency of practically all manner of commodities continues, and indications are that we are yet some distance from the peak.

Shipping

So far as our leading steamship lines are concerned, the season's arrangements are well advanced, freight services as well as some passenger services being already inaugurated. Prospects are of the brightest description for an active and remunerative business in both spheres, and no effort is being spared in equipping to meet it. Perhaps the most interesting development of the past month has been the acquisition by the Canada Steamship Lines of the fleet of the St. Lawrence & Chicago Steam Navigation Co.

Wood and Steel Shipbuilding

The revival of wood shipbuilding on our Atlantic seaboard warrants passing notice, and, taken in conjunction with the activities of and demand for this class of vessel, it may not be amiss to infer that our Maritime Provinces of New Brunswick and Nova Scotia will achieve again at least a fair measure of the glory of accomplishment that the building of "wind jammers" brought them ere steel shipbuilding took pride of place. The shortage of "bottoms" of every construction and size is, of course, primarily responsible for the rejuvenation of the wood shipbuilding industry, although doubtless the high prices obtainable for such type craft is giving added impetus to the industry.

The propagation and development of steel shipbuilding and marine engineering is not, however, being allowed to lie dormant as a reference to the address delivered before the Canadian Manufacturers' Association in Montreal, by Col. Cantley, president of the Nova Scotia Steel & Coal Co., New Glasgow, N.S., amply proves. An abridged report of same appeared in our issue of April 27. Both the need for an up-to-date Canadian merchant marine and for its being in large part, if not wholly a Canadian product, are given ample vindication, and the parallel drawn and the results achieved through Government recognition and support of railroad and steel manufacturing enterprises is distinctly illuminating, well-timed and forceful as an argument.

The reference by Col. Cantley to Government support of our steel industries in years past is one that is easy of appreciation in times like the present, bringing vividly to our mind's eye the practically certain conditions that would have prevailed in Canada during these months of war—absence of munition and war supplies orders, had steel-making lacked the national recognition that has enabled it to place our Dominion on a production plane of world competitive degree. It is but natural to expect that what has been accomplished through Government support of railroad transportation and steel-making, will be equally procurable in the realm of shipbuilding.

Concerted action is, of course, necessary so that the proposition as outlined by Col. Cantley assume definite shape and become effective, and perhaps no better opportunity could have been secured than that provided by a meeting of the Canadian Manufacturers' Association, sectional although it happened to be. A large percentage of those present on the occasion of Col. Cantley's address had a more or less vital interest in what he had to tell them, and the fact that his keenness of perception in business matters generally and his dogged perseverance in pursuing an ideal to its logical end, may be taken as an earnest that the movement to support shipbuilding in Canada will not only continue to gather weight, but will begin to show results before long.

The dearth of freight carriers—lake and ocean, is of immediate importance to this Dominion, just as much so, as to any other nationality, and we look to see the authorities at Ottawa deal with the situation in such a way as to mitigate to the fullest extent possible the inconvenience thereby caused by stimulating shipbuilding on a generous scale on our lake and ocean borders.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh		$18 70
Lake Superior, charcoal, Chicago		19 75
Michigan Charcoal iron		28 00
Ferro nickel pig iron (Soo)		25 00
	Montreal.	**Toronto.**
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Victoria, No. 1	$27 00	$25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	3.00
Steel bars, f.o.b., Toronto	3.00
Steel bars, 2 in. and larger, base	5.25
Common bar iron, f.o.b., Montreal	3.00
Steel bars, f.o.b., Montreal	3.00
Twisted reinforcing bars	3.25
Bessemer rails, heavy, at mill	2.50
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	3.00
Small shapes	3.25
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	3.10
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$33 00	$32 00
Electrolytic copper	32 50	31 75
Castings, copper	31 00	31 50
Tin	50 00	56 00
Spelter	23 00	22 00
Lead	10 00	10 00
Antimony	45 00	47 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in.	$4 00	$4 00
Heads	4 25	4 25
Tank plates, 3-16 in.	4 30	4 50

WROUGHT IRON PIPE

Prices in effect April 26, 1916.

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 06	5 31
1/2 in.	3 91	6 08
3/4 in.	4 72	7 65
1 in.	6 97	11 31
1 1/4 in.	9 43	15 30
1 1/2 in.	11 28	18 29
2 in.	15 17	24 61
2 1/2 in.	23 99	38 90
3 in.	31 37	50 87
3 1/2 in.	37 72	61 18
4 in.	44 69	72 49

Lapweld

	Black	Galv.
2 in.	$17 02	$26 46
2 1/2 in.	25 16	40 07
3 in.	32 90	52 40
3 1/2 in.	39 56	63 02
4 in.	46 87	74 67
4 1/2 in.	57 15	90 81
5 in.	66 60	105 82
6 in.	86 40	137 28
7 in.	116 62	179 70
8 in. x 25 lbs. per ft.	122 50	188 75
8 in. x 25 lbs. per ft.	141 12	217 44
9 in.	169 05	260 48
10 in. x 32 lbs. per ft.	156 80	241 60
10 in. x 40 lbs. per ft.	201 88	311 06

Ontario List.

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 06	5 43
1/2 in.	3 91	6 08
3/4 in.	4 72	7 65
1 in.	6 97	11 31
1 1/4 in.	9 43	15 30
1 1/2 in.	11 28	18 29
2 in.	15 17	24 61
2 1/2 in.	23 99	38 90
3 in.	31 37	50 87
3 1/2 in.	37 72	61 18
4 in.	44 69	72 49

Lapweld

	Black	Galv.
2 in.	$17 02	$26 46
2 1/2 in.	25 16	40 07
3 in	32 90	52 40
3 1/2 in.	39 56	63 02
4 in.	46 87	74 67
4 1/2 in.	57 15	90 81
5 in.	66 60	105 82
6 in.	86 40	137 28
7 in.	116 62	179 70
8 in. x 25 lbs. per ft.	122 50	188 75
8 in. x 25 lbs. per ft.	141 12	217 44
9 in.	169 05	260 48
10 in. x 32 lbs. per ft.	156 80	241 60
10 in. x 40 lbs. per ft.	201 88	311 06

Quebec and Maritime Provinces List.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 25	$18 25
Copper, crucible	21 75	21 50
Copper, heavy	22 00	22 00
Copper wire	22 00	22 00
No. 1 machine compos'n.	17 00	17 00
No. 1 compos'n turnings.	15 00	15 00
New brass clippings	16 25	15 00
No. 1 brass turnings	12 00	12 00
Heavy melting steel	9 00	10 00
Boiler plate	11 75	10 50
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	11 50	9 00
Stove plate	10 50	10 50
No. 1 machin'y cast iron	14 75	14 50
Heavy lead	7 00	7 25
Tea lead	6 25	6 25
Scrap zinc	15 00	15 75
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	55
Stove bolts	65
Plate washers	30
Machine bolts, 3/8 and less	47 1/2
Machine bolts, 7-16 and over	37 1/2
Blank bolts	37 1/2
Bolt ends	37 1/2
Machine screws, flat head, iron	06 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in. $3.75 per lb. off	
Nuts hex., over 1 in. $2.00 per lb. off	
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	37 1/2
Boiler rivets, base, 3/4-in. and larger	$4.60
Structural rivets, as above	4.50
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS.

	Per cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	50
Finished Nuts over 1 in.	37 1/2
Semi-Fin. Nuts up to 1 in.	50
Semi-Fin. Nuts over 1 in.	37 1/2
Studs	45

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	68 50
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES.

Standard steel wire nails, base	3 45	3 65
Cut nails	3 40	3 40
Miscellaneous wire nails	65%	
Pressed spikes, 5/8 diam., 100 lbs.	$3 75	

MISCELLANEOUS

Solder, guaranteed	0.31½
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.18
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls., gal.	0.75
Linseed oil, raw, single bbls.	0.96
Linseed oil, boiled, single bbls.	0.99
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Lead wool, per lb.	0.13
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	50
Standard drills over 1½ in.	15
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	10
Bit stock	50
Ratchet drills	15
Machine bits for wood	10
S.S. drills for wood	20
Wood boring brace drills	35 and 5
Electricians	20
Sockets	50
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks	list plus 5
Bridge reamers	55
Centre reamers	5
Chucking reamers	5
Hand reamers	5

High speed drills and reamer prices withdrawn.

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 5 per cent.; B and C, 25 per cent.; cast iron, 50 and 10; standard bushings, 60 per cent; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$4 10	$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 25	4 25
Canada Plates, all bright	6 30	6 00
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 00	6 75
Premier, No. 28, U.S.	7 25	7 00
Premier, 10¾ ozfl.	7 50	7 25

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.35
⅜ in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
⅝ in.	6.35
¾ in.	6.15
⅞ in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B.B

⅛ in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16 in.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	65-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	.....
1¼ in.	19 55	.....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	12 75
2¼ in.	26 60	15 45
2½ in.	29 00	17 20
3 in.	38 70	19 50
3½ in.	44 00	24 00
4 in.	49 50	30 60

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble, 40 & 10%	
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

BELTING RUBBER

Standard	50%
Best grades	30%

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.16
Peerless	.16
Grand	.15
Superior	.15
X L C R	.14
Atlas	.14
X Empire	.13
Ideal	.13
X press	.12
COLORED.	
Lion	.10¼
Standard	.9¼
No. 1	.9¼
Popular	.8¼
Keen	.7¼

WOOL PACKING.

Arrow	
Axle	Prices on
Anvil	application
Anchor	

WASHED WIPERS.

Select White	
Mixed colored	Prices on
Dark Colored	application

This list subject to trade discount for quantity.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.37 to .39
Tin	.58 to .60
Zinc	.26 to .28

Prices Per Lb.

COPPER SHEETS

	Montreal	Toronto
Bars. ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 m.	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

MILL PRODUCTS

Taper pins	.65
Coupling bolts	net
Planer head bolts, without fillet	.15
Planer head bolts, with fillet	net
Planer head bolt nuts up to 1 in.	.60
Planer head bolt nuts, over 1 in.	.55
Planer bolt washers	list plus 10
Hollow set screws	list plus .20
Collar screws	list plus.20
Thumb screws	.20
Thumb nuts	.75

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy	.35
Copper sulphate	.30
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

requirements of the trade are as pressing as ever, and the mills are hard put to it to meet deliveries. In many cases recent advances have been made with the object of discouraging further buying. The volume of business at the mills is so large that producers have been unable to catch up with deliveries, and stock supplies are constantly being reduced. In many instances factories have been greatly handicapped owing to the non-delivery of raw material. The supply of plates is gradually improving, but little relief is evident, as the mills are booked far in advance and the demand continues. An advance of $5 per ton has been placed on plates, and these are now quoted at $4 for ¼ to ½; heads at $4.25, and 3-16 inch tank plates at $4.30 per hundred. Prices on cold rolled shafting have again advanced $5 a ton; many producers are booked for the remainder of the year, premiums being offered for small early shipments. Dealers here are now asking 50 per cent. plus list prices. The difficulty in securing sheet bars and the heavy demand for finished product, especially for blue annealed, electrical and deep stamping sheets is keeping prices on the upward path. Black sheets, 28-gauge, are now $4.10; 10-gauge, $4.60; Canada plates, dull, $4.25; Colborne crown, No. 28, $7. These prices show an increase of approximately ¼c over last week. With many of the large consumers practically covered for from six months to a year, the demand for boiler tubes is apparently as great as ever, and prices are ever upward. An average of 10 per cent. has been added to the prices on lapwelded tubes from 2 inches up; 2-inch being now $12.75; 2¼ now $15.45; 2½ now $17.20; 3-inch now $19.50; 3½ now $24, and 4-inch now $30.60 per hundred feet.

Machine Tools and Supplies

The heavy demand for machinery in large quantities has been falling off for some time, but tool builders are kept busy filling contracts, not only for munition plants, but also the continual demand for domestic equipment. Inquiries are very good for small orders, which involve one or two tools. Some inconvenience is anticipated during the next few weeks, owing to labor troubles and settlements, but it is generally expected that satisfactory agreements will be arrived at, which will prevent any serious results at the present time. The unceasing demand for all kinds of supplies continues, and prices in many cases are still advancing.

Old Materials

Trade in scrap materials is quiet, and, while dealers are well supplied, the demand from consumers is light. Many of the mills are well stocked, and there is little indication of early buying. Prices generally are declining in the States, but

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., May 1, 1916.—The industrial situation is becoming seriously affected by the apparent shortage of labor, and many plants are experiencing great difficulty in securing and retaining sufficient help to keep them operating. In addition to the scarcity of men, the possibility of labor troubles are evident in many circles, which makes it hard to define the present and immediate future conditions. The opening of navigation has materially aided in the transportation of materials, but insufficient tonnage of vessels is resulting in the reopening of shipyards which have long been closed. There is also a possibility of establishing new plants for the construction of steel vessels on a large scale. Orders for additional munitions are still being placed, and shell making plants are still working at capacity, but in some instances are inconvenienced by lack of raw material and shortage of help. Many plants have, during the past few months, made large additions to their factories.

Pig Iron

The pig iron situation remains unchanged. Many of the large furnaces have been obliged to refuse additional orders, as their books are filled to the close of this year, and in some cases well into 1917. Prices, however, are holding firm.

Steel

While the demand for steel and steel products has apparently fallen off, the

prices here are firm. Wrought iron pipe has advanced 1c, and is now quoted at 11½c. Heavy lead is ½c weaker at 7c per pound. Scrap zinc shows a similar decline, being quoted at 15c per pound.

Metals

The general tone of the metal market is one of dullness, with prices weakening. The heavy buying noted in copper a few weeks ago has been followed by a spell of quietness, and the market at present is inactive. Tin is also quiet, and some difficulty is being experienced in obtaining permission to ship metal. Spelter is very quiet, and the supply is becoming greater than the demand. Lead is lower and demand falling off. Antimony is plentiful and prices are declining.

Copper.—Following the heavy demand of the past month, the market has become comparatively quiet, and inquiries for spot and future metal are light. Owng to the heavy sales,recently made to foreign buyers, it is almost impossible to secure first or second quarter delivery. New York quotations for August delivery for electrolytic are nominal at 28½ cents. London reports a strong market, £140 being quoted for electrolytic. The general situation is one of firmness, and prices remain strong and unchanged. Local dealers are asking 33c for lake, 32½c for electro, and 31c for castings.

Tin.—The feature of the week's market is the prevailing uncertainty of obtaining shipping licenses in London. Some inconvenience is expected in securing tin to meet the requirements of existing contracts. However, most consumers are well covered for early needs, and the general tone of the market is quiet and inclined to weaken. New York quotes 49¾c, being 1¼c lower than the previous week. Dealers here report fair demand, and prices are firm at 50c per pound.

Spelter.—The dullness in the spelter situation is having the effect of weakening the market, and prices are declining. Considerable metal is being offered for re-sale in many quarters, and further weakness is looked for. The present condition is largely due to recent reports of the U. S. Geological Survey, which show large prospective increases in production. A decline of 1c is noted in New York prices, but local conditions are unchanged and prices are firm at 23c.

Lead.—The present lead situation is quieting down, and the market is showing signs of dullness. The export demand is falling off and domestic needs are lighter. Consumers are well supplied for immediate needs, and are not anxious to buy, although sellers are anxiously looking for bids. Both the Trust and outside prices are lower, and the nominal quotation in New York is 7½c. Local conditions are unchanged, with prices firm at 10c.

Antimony.—Plentiful supplies of antimony are resulting in a quiet market, and prices are declining. Dealers here report a decline of 2c; this week's price being 45c per pound.

Aluminum. — Unchanged conditions prevail and prices are firm at 68c.

Toronto, Ont., May 2. — Customs revenues continue to make an exceptionally good showing and the returns for April are a fair indication of what may be looked for during the year. The revenue for April was $10,346,000, being $4,070,000 more than the corresponding month of last year. The increase is largely accounted for by importations of materials being used in the manufacture of goods destined for shipment abroad. Although the export trade is steadily increasing it is being seriously handicapped by the shortage of ocean tonnage. The situation in this regard is acute and there appears to be little prospect of any improvement this year.

The congestion of freight on the railways has been relieved to some extent, but the embargo on shipments to Eastern points is causing considerable inconvenience to manufacturers. The scarcity of labor in conjunction with a shortage of raw materials will result in a scarcity of many finished iron and steel products. Prices continue to advance and there is no indication that the top has been reached. The more important lines affected this week include wrought iron pipe, cut nails, wrenches, some makes of taps and dies, etc., some sizes of boiler tubes and cotton waste.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Steel Market

The extraordinary activity in the steel trade is unabated and the mills continue operating at full capacity. Plants are being extended to take care of the increasing demand but a shortage of labour is a problem which is becoming more and more serious. The output of steel is increasing in tonnage but at the same time deliveries are getting more backward. Prices of steel products continue to advance due to the shortage of raw materials and general activity in the trade. A further advance in wrought iron pipe has been made following higher prices in the States. The advance is two points on black, and three points on galvanized pipe. The demand for pipe is heavy and the market very firm. Some sizes of lapwelded boiler tubes, 2-in. to 3-in. have advanced about 10 per cent. Here again the market is very firm and a further advance is looked for. Nearly all makers of locomotive and merchant tubes are sold up for practically the remainder of the year.

Prices of cold rolled shafting have advanced in the States but are unchanged locally in the meantime, although higher prices are expected. Cut nails have advanced 20c and are now at $3.40 per 100 lbs., per keg base. Higher prices for wire nails are expected in the trade but they are unchanged this week. A new price on rivets has been announced. Boiler rivets ¾ in. and larger are now quoted at $4.60 and structural rivets same sizes, $4.50 per 100 lbs. New discounts on nuts have been issued. Finished and semi-finished nuts up to 1 in. are now 50 per cent., and finished and semi-finished nuts over 1 in., 37½ per cent. The new discount on iron rivets, 7-16 in. and smaller, is 37¼ per cent. Higher prices on bolts are looked for in the near future.

The market for sheets continues strong and quotations very firm with an upward tendency. The new demand for blue annealed sheets is still heavy, some mills being sold up for the entire year. The production of steel sheets is nearly up to rolling capacity but there is still some trouble in getting sheet bars. The situation in the galvanized sheet trade is unsettled owing to the high price of black sheets and spelter. Some galvanizers are not operating their plants while others have considerably reduced their production.

The steel market in the United States is steadier and few price movements are noted during the week. The situation is unchanged, the demand on the mills for deliveries being as insistent as ever. Steel bars are unchanged at 3c, plates 3.75c, and shapes 2.60c, f.o.b. Pittsburgh. Forging billets have advanced and are now being quoted at $68.50 per ton, Pittsburgh. Wire rods are still being quoted at $60 per ton Pittsburgh for shipment at mill convenience.

Old Metals

The market for old materials is generally easier and business dull. Prices of copper and brass scrap are firm but the market is quiet. Heavy melting steel is stronger and has advanced, being now quoted at $10. Stove plate and No. 1 cast iron are also higher, being quoted at $10.50 and $14.50 per ton.

Machine Tools

The market is quieter and the demands for machine tools lighter than for some weeks. Those concerns who are changing over their plants to make larger calibre shells are buying some equipment and there is also a fair demand for standard tools particularly for tool rooms.

Supplies

The general tendency of prices continues upward and a number of lines have advanced recently. The new discount on "Trimo" and "Stillson" wrenches is 60 per cent off list, and parts 57½ per cent. The Butterfield Co., have issued a new discount list which covers general advances of about 5 per cent. Some of the more important new discounts are: pipe stocks and dies: Nos., 0, 3, and 4, 60 per cent.; Nos. 1, 1½, and 2, 70 per cent.; dies, Nos. 0 and 3, 50 per cent.: Nos. 1 to 2, 60 per cent.; Reece taps, blacksmiths, 40 per cent.; machinists hand, ¼ to 1, 50 per cent.; machine screw, 60 per cent. and 55 per cent.: Reece screw plate, 50 per cent. Pipe taps 1¼ to 2, 70 per cent.

Prices of white and colored cotton wiping waste have been advanced ¾c per lb., owing to the high cost and scarcity of raw materials. Prices on wool packing waste and washed cotton wipers are still withdrawn and are only on application. The linseed oil market is weaker and prices have declined 1c per gallon. Oil is now quoted at 96c for raw and 99c for boiled. Turpentine has declined 2c and is now quoted at 75c per Imperial gallon. Gasoline and benzine are unchanged but an advance is expected in the near future.

Metal Markets

The feature of the market is the continued strength of copper which is a shade higher than last week. The demand is still heavy but considerably less than it has been recently. Tin is unchanged but is firm and the market has an upward tendency. Spelter is also firmer and buyers are showing more interest in the market. Lead is dull and the outside market is weaker being now at the same level as the "Trust" figure. Antimony is weaker on all positions and quotations have declined slightly. The aluminum market is featureless and unchanged. Solders are quoted at the same level as last week.

Copper.—The market is very strong and a continued good demand is reported. The producers are in full control of the market and they are now sold so far ahead that they are not in a position to supply any large buying demand except for delivery during the fourth quarter. Copper has advanced ½c locally and is now quoted at 32c per pound, nominal.

Tin.—The market is firmer with an upward tendency. The tin situation is stronger and there is a good demand for this metal. Local quotations are unchanged and nominal at 56c per pound.

Spelter. — The New York market is steady and firm but London advanced £2 per spot and £1 on futures. The French Government is buying big tonnages of spelter in the United States market. Local are unchanged at 22c per pound.

Lead.—The market is dull and weaker. The "Trust" is holding lead at 7.50c New York, but the outside market has declined and is now at the same level as the "Trust" figures. Lead has declined ½c locally and is now quoted at 10c per pound.

Antimony.—The market is weaker in all positions and no improvement is noted in the demand. Antimony has declined 1c locally and quotations are nominal at 47c per pound.

Aluminum.—The market is featureless and unchanged at 68c per pound.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

REVIVAL IN WOOD SHIPBUILDING

SO great is the demand for Canadian tonnage that it has been found necessary to revert to the building of wooden vessels of the sailing type, a condition somewhat unique in the shipping world. When steel-built vessels supplanted the wooden craft, few of which have been constructed in recent years, it was never thought that the old-style craft would ever be revived. War has, however, changed conditions, and incidentally brought about a condition of affairs on the upper lakes that was never dreamt of before the war started.

A. B. MacKay, of Hamilton, a well-known vessel owner in Canadian marine circles, states that he has placed an order with a shipbuilder at Meteghan, Digby County, Nova Scotia, for the construction of a four-masted wooden vessel, to cost $75,000. The same firm has just laid keels for ten vessels of a similar type for other Canadian owners. These vessels will be used in the North and South America coastwise trade and in the West Indies service, and under the terms of the contracts they are to be delivered for service in October next. Their gross tonnage will be 1,200 tons.

The scarcity of Canadian tonnage occasioned by the transferring of some forty-five freighters from the upper lakes to salt water service has created a keen and spirited revival in the shipping world for vessels of all types, many of which have changed ownership since the outbreak of the war. While many of the leading vessel owners have been prepared to place orders for the building of new vessels, it has been found almost impossible owing to the increased price of steel, the delivery of which would not be guaranteed within a limited time.

The consequence has been that the wooden vessel has found a ready market by reason of the fact that the timber is available, and the builders are in a position to guarantee deliveries in time to meet the demands of the vessel interests, hence the preference for the sailing craft under existing conditions. Mr. MacKay states that the schooners will be completed in every detail, and will be fully equipped with all the modern appliances necessary for the loading and unloading of cargoes.

WIND JAMMERS STILL A FACTOR

THE war's effect on the shipping industry was made evident recently in Montreal, when it became known that the sailing schooner "N. W. White," 90 tons net register, wintering in the harbour, and recently purchased by the Eastern Canada Fisheries, Ltd., had been chartered to carry a cargo of lumber to the British Isles at the record figure of 360s. a standard. When it is considered that before the war the rate was 33s. 6d. a standard for vessels of similar tonnage, it will be readily seen what a tremendous increase in freight rates the present scarcity of tonnage is causing.

The company recently purchased from Captain Bernier, of Quebec, the schooner "Minnie Maud." This vessel, which has been owned by Captain Bernier for several years and used by him on some of his Arctic expeditions is of 200 tons capacity, and of the regular sailing ship type which, about fifty years ago frequented the Port of Quebec, and were at that time big factors in the shipping industry of the city. These primitive vessels, the "Minnie Maud" was built in 1891, and the "N. W. White," as long ago as 1878, are now undergoing general repairs when they will be placed in charge of experienced mariners, and placed on the high seas.

A few years ago these wooden craft

were at the suggestion of the underwriters, removed from ocean service, as they were regarded as a menace to the shipping trade, as well as being dangerous to the more modern and faster steamers, who occasionally ran them down in heavy fogs, causing loss of life, and cargo, resulting in the insurance rates on this class of transport being doubled. Mariners were therefore obliged to abandon the high seas, and seek the fishing trade as a source of livelihood. Now, after a period of some twenty years, it would seem we are obliged to resort to the primitive and slow craft of a generation ago.

ZINC AND SPELTER IMPORTS

PRIOR to the war about 50 per cent. of the blocks, pigs and bars, etc., of zinc came from Belgium, 20 per cent. from Germany, 15 per cent. from Great Britain and 15 per cent. from the United States. About 75 per cent. of the spelter came from the United States before the war, and now the United States is supplying practically all the blocks, pigs, bars, etc., and also the spelter. Very little is coming from Great Britain. The U.S. had been getting zinc ore from Canada in the vicinity of Trail, B.C.

Canadian imports of zinc and spelter for the year ending March, 1914, were:

Blocks, pigs, bars, etc., 45,700 cwt., with a value of $271,100.

Zinc spelter, 117,000 cwt., with a value of $600,000.

For the year ending March, 1915, the imports were:

Blocks, pigs, bars, etc., 30,240 cwt., with a value of $200,000.

Zinc spelter 130,000 cwt., with a value of $712,000.

For 11 months ending February, 1916, the imports were:

Blocks, pigs, bars, etc., 11,260 cwt., with a value of $198,000.

Zinc spelter, 130,250 cwt., with a value of $1,889,000.

CUSTOMS REVENUE INCREASE

A sixty-five per cent. increase in Canadian Customs revenue is shown by the figures for the month of April just ended, as compared with those for the same month of last year. The revenue for the past month was $10,346,000, which is $4,070,000 more than the corresponding month of 1915, when it was $6,276,000.

April is the first month of the present fiscal year, and its showing may be taken as an augury of the trend of Customs revenue. It is noteworthy in this connection that the Customs revenue of April, 1915, exhibited a decrease of $200,000 as compared with the same month in 1914, so that in starting off the present fiscal year with a four-million-dollar advance, Canadian revenues are making an exceptionally good showing.

Vancouver, B.C.—The Begg Motor Co. will build an addition to their plant.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Halifax, N.S.—The Halifax Graving Dock Co., will erect a machine shop on their property here.

Quebec, Que.—Price Brothers & Co., are considering extensions to their lumber mill, to cost about $200,000.

Toronto, Ont.—The Brandon Co., propose building a machine shop at West Toronto to cost approximately $5,000.

Ingersoll, Ont. — The new purifiers have arrived at the gas plant and preparations are being made for their installation.

Toronto, Ont.—The Toronto Harbor Commissioners are to erect a brick machine shop on the Don division near Mill street at a cost of $13,500.

Truro, N.S.—The town council contemplate buying, and renovating the Chalmers Electric Co.'s plant. New power plant equipment will be installed.

Listowel, Ont.—Hydro Electric Radiation, Ltd., are considering the erection of a factory. Manager, G. E. Harrison, 704 Traders Bank Building, Toronto.

Hamilton, Ont.—A building permit has been issued to the Dominion Sheet Metal Co., for the erection of a factory extension on Burlington street, to cost $6,000.

Kirkland Lake, Ont.—H. Oakes, Lake Shore Mine, is in the market for a 200 h.p. motor, air compressor, drills and pumps.

Medicine Hat, Alta.—The Saskatchewan Bridge & Iron Works is contemplating the completion of its plant this year.

Berlin, Ont.—The Onward Mfg., Co., will build a factory here, 45 x 100 ft., three stories, for the manufacture of electric vacuum cleaners, etc., T. A. Witzel is manager.

Toronto, Ont.—The Toronto Type Foundry Co., is in the market for one 10-in. or 12 x 42-in. universal grinding machine, one 3 or 4-ft. radial drilling machine, and one tool and cutter grinding machine.

Medicine Hat, Alta.—The Dominion Harvester Co., whose plant was recently destroyed by fire are making arrangements to start operations in another building. The company are in the market for machine tools and other equipment.

St. Catharines, Ont.—The contract for the Canadian Aloxite factory has been awarded to Brown-Pollard Co., of Niagara Falls, N.Y. The plant will be erected at Montrose, and the building will cost $100,000. There will be three railway sidings to the property.

New Toronto, Ont.—The Brown Copper & Brass Rolling Mills are building an extension to the plant for the manufacture of munitions. This is going to be a fireproof structure of brick and steel. The work on this extension, which has been going on for some time, will be finished almost immediately.

St. John, N.B.—The first step in building Messrs. T. McAvity & Sons' large iron foundry on the site between the Marsh Road and Westmorland Road was taken recently, when the firm made application to the city council to confirm the agreement made in April, 1914, by Act of the Legislature, defining the terms of purchase, release of the old Water Street premises, etc.

Electrical

Petrolia, Ont.—The installation of the new street lighting has practically been completed and the formal opening will take place shortly. The system has cost about $35,000.

General Industrial

Berlin, Ont.—The Onward Mfg. Co. are building an addition to their factory.

Brantford, Ont.—It is reported that an American concern contemplates establishing a woollen mill here.

Hamilton, Ont.—The Graselli Chemical Co., will build an addition to their factory here to cost about $30,000.

Medicine Hat, Alta.—The Lake of the Woods Milling Co.'s plant was totally destroyed by a mysterious fire on April 28. The loss is estimated at $500,000.

Guelph, Ont.—The White Sewing Machine Co., of Canada, have taken over the business of the Raymond Mfg. Co., of this city. The company have purchased a 20-acre site in St. Patrick's ward where a new factory will be erected. W. W. Chase, secretary of the White Co., of Cleveland, Ohio, is manager of the new concern, which is capitalized at $500,000.

Winnipeg, Man.—The mills of the Rice Malting Co. of Canada, in St. Boniface, were destroyed by fire on April 30. The whole plant is a total loss, amounting to over $300,000, with insurance of $200,000. R. Rice is president and general manager of the company.

Municipal

Victoria, B.C.—An extension to the high pressure water system is contemplated.

Levis, Que.—Extensions to the water distribution system are contemplated by the town council.

Ridgetown, Ont.—A by-law will be submitted to the ratepayers to sanction improvements to the waterworks system.

North Bay, Ont.—The city council propose extending the water main system. Cast iron pipe will be required.

Winnipeg, Man.—The city council have decided to purchase a gasoline engine driven pumping outfit for the Fire Department at a cost of about $9,000.

Rodney, Ont.—A by-law to authorize the installation of a lighting and power distribution system will be submitted to the ratepayers. Estimated cost, $7,000.

Dundas, Ont.—The town council propose building a sewage disposal plant at an estimated cost of $38,500. Aird Murray & Lowes, of Toronto, are engineers.

Port Carling, Ont.—The Town Council propose spending $1,000 on electric lamps. A by-law will be submitted on May 15.

Elmira, Ont.—The ratepayers will vote on a by-law shortly to sanction a loan of $6,000 to the Ideal Shoe Co., who propose building a factory here.

Matheson, Ont.—A by-law will be submitted to the ratepayers to raise $25,000 for waterworks and sewage disposal systems.

Smith's Falls, Ont.—A by-law was carried here recently authorizing an expenditure of $1,600 on improvements to the waterworks system.

Welland, Ont.—The Dominion Incinerator Co. will construct an incinerator plant here. W. M. German, M.P., of this town, is interested in the company.

Gore Bay, Ont.—A by-law will be submitted to the ratepayers on May 8 to authorize a $500 bonus and tax exemption to W. E. George, who proposes to erect a planing mill here.

Arthur, Ont.—A by-law will be submitted to the ratepayers on May 8 to raise $15,000 for the purchase of John Philip's electric lighting plant and to provide for the cost of a distribution system.

Galt, Ont.—The ratepayers on April 28 turned down an opportunity to add to the fire fighting appliances of the city, defeating a by-law for the purchase of a motor fire engine by a vote of 277 to 380, and a by-law for a fire alarm system by a vote of 244 to 422. The Fire Underwriters' Association find conditions in Galt very unsatisfactory.

Personal

Leonard Foulds and A. B. Bowes have opened an office at 166 Bay street, Toronto, as structural and civil engineers.

Wm. Steele & Sons Co., Philadelphia, Pa., architects and engineers, have opened an office at Room No. 423, Ryrie Bldg., Toronto.

Richard Reid, agent-general for Ontario, and **John Howard**, agent-general for Nova Scotia, are in Paris attending the Inter-Parliamentary Commercial Congress, which opened on April 27.

F. G. Smith, salesman with the A. C. Leslie Co., of Montreal, has left for Winnipeg, where he has received a commission as Lieutenant in the 183rd Overseas Battalion.

Trade Gossip

The Hudson Bay Zinc Co., of Salmo, B.C., has been incorporated with a capital of $5,000,000.

The Grand Lake Coal Co., of Fredericton, N.B., has been incorporated with a capital of $49,000.

The Pioneer Elevator Motor Repair Co., of Winnipeg, has been incorporated with a capital of $5,000.

The Canadian Ice Machine Co., Toronto, have been awarded a contract for an ice plant for the hospital at Hamilton, Ont., at $3,645.

The Otis-Fensom Elevator Co., Hamilton, Ont., have been awarded the contract for an electric elevator for the new hospital at Hamilton, Ont.

Port Arthur, Ont.—It is reported that the blast furnace capacity of the Atikokan Iron Co., will be considerably increased and that operations will begin shortly. J. Dix Fraser is manager of the company, which has recently been reorganized.

William Kennedy & Sons., Owen Sound, Ont., are making a specialty of casting and cutting off steel ingots ready to forge into shells of any size, but particularly those 6 inches in diameter. About 2,500 tons of steel ingots monthly, including shell steel, can be supplied by this concern for the next six months.

The Turbine Equipment Co., Toronto, have recently secured a contract from the Imperial Oil Co., of Sarnia, Ont., for four single-stage De Laval centrifugal pumps, which will be direct-connected to 75 h.p. motors. The capacity of each unit is 3,750 gallons a minute, against 95 ft. total head. The company have also received an order from the Standard Chemical Co., of Toronto, for one 1¾ million-gallon De Laval centrifugal pump, to operate against 125 ft. total head.

Clyde Shipyard Workers.—According to the Liverpool Courier, many Clyde shipyard workers are at present earning over $2,500 a year, and are not paying one cent into the National Exchequer. Shipyard workers can easily make $50 weekly, and even work less than the usual stipulated fifty-four hours. Some squads of riveters—three men and a boy—have earned $163 weekly since the war broke out, the hours worked being only forty-eight. Our contemporary gives the source of its information as a prominent Clyde shipbuilder.

Electric Furnace Development.—A recent article in the trade press called attention to the fact that all the electric furnaces in Germany, operating under war conditions, were turning out 129,646 metric tons of steel every twelve months. We are advised that if the Snyder electric steel furnaces recently sold, and those in operation to-day were suddenly mobilized for war service, on a twenty-four hour basis, they would turn out 77,975 tons of steel every twelve months, or within 40 per cent. as much steel as all the electric furnaces operating in Germany. These figures do not, of course take into consideration twelve furnaces sold in foreign countries, as well as several furnaces sold on this continent which cannot be used for the melting of steel. Europe is the mother of the electric furnace, and the steel foundrymen in Europe are considered very progressive. Judging, however, from the above facts, we also are keenly alive to the value of the electric furnace.

Tenders

Burlington, Ont.—Tenders will be received up to May 13, 1916, for a two-ton combination chemical engine hose truck. Specifications on application. Jas. S. Allen, clerk.

Hamilton, Ont.—Tenders will be received up to May 8, 1916, for supplying mechanical rakes and appurtenances for Gage avenue pumping station. Plans and specifications may be obtained upon application to A. F. Macallum, city engineer.

Toronto, Ont.—Tenders will be received by the Chairman Board of Control, City Hall, up to May 9, 1916, for the supply of two gasoline-driven diaphragm pumps. Specifications and forms of tender may be obtained at the Works Department, Room 6, City Hall.

Regina, Sask.—Tenders for glass insulators, toppings, connecting sleeves, cross arms, galvanized iron wire, pole line hardware, steel strand wire, anchor rods will be received until May 6. Specifications, form of tender and all information may be obtained on application to the Department D. C. McNab, deputy minister, Department of Telephones, Regina.

Ottawa, Ont.—Tenders for submarine cable will be received at this office until May 15, 1916, for 10 knots of single conductor submarine telegraph cable (107 lbs. copper and 150 lbs. gutta percha per knot), with sheathing of 12 No. 8 S.W. G. iron wires, to be delivered at Halifax, N.S. Specification and forms of tender can be obtained on application to the office of the general superintendent of the Government Telegraph Service at the Department of Public Works, Ottawa.

Toronto, Ont. — Tenders will be received up to May 6, 1916, for the undermentioned trades required in the erection of a factory building for The T. Eaton Co., at Toronto, Ont., iron work, rolled steel sash, steel partitions and doors, sheet metal work, roofing, waterproofing, rolling steel doors. Plans and specifications may be seen and form of tender obtained by applying at the office of Wm. Steele & Sons Co., 423 Ryrie Building, Toronto.

Contracts Awarded

Dartmouth, N.S.—The Rhodes Curry & Co., Halifax, have been awarded the general contract for the addition to the Williston Steel Foundry Co. plant.

Halifax, N.S.—The city council have awarded contracts to Drummond, McCall & Co., for cast iron pipe, and to Dartmouth Foundry Co., for castings.

Toronto, Ont.—The Board of Control has awarded a contract for thirteen car bodies for the civic street cars to the Preston Car Co., of Preston, Ont. The price was $4,907 each.

The Matagami Pulp & Paper Co. have awarded a contract for a power house to be erected at Smooth Rock Falls, Ont. W. Morrow & Beatty Co., Peterborough, Ont., contractors.

New Incorporations

The Comfort Mining and Leasing Co., has been incorporated at Toronto, with a capital of $40,000 to acquire and develop mineral and deposits. Head office at Cobalt, Ont. Incorporators, Geo. Ross, Thos. G. Code and F. A. Todd all of Toronto.

Corrugated Paper Box Co., has been incorporated at Toronto, Ont. with a capital of $200,000 to manufacture corrugated paper and paper boxes of every kind. Head office at Toronto. Incorporators, James H. Spence and Grant Cooper of Toronto.

The Canadian Aloxite Co. Ltd., has been incorporated at Ottawa, Ont. with a capital of $100,000 to manufacture, abrasives, chemicals, spirits, explosives and other products. Head office, Stamford, Ont. Incorporators, Reginald H. Parmenter, Arthur J. Thomson and W. Symon Morlock all of Toronto.

The Kaustine Co., has been incorporated at Toronto, Ont., with a capital of $40,000 to carry on business as sanitary engineers and general manufacturers and contractor. Head office to be at Toronto. Incorporators, Harry A. Newman and Williams E. Sommerville of Toronto.

The Byrns Pneumatic Ship Raising Co., Ltd., has been incorporated at Toronto, with a capital of $40,000 to acquire by purchase patents of invention granted for apparatus for raising submerged ships. Head office, Hamilton, Ont. Incorporators, Harry Byrns and William F. Condon of Hamilton.

The Flint Varnish & Color Works of Canada, Ltd., has been incorporated at Ottawa, Ont., with a capital of $250,000 to manufacture oils, paints, varnishes enamels, colors, etc. Head office at Toronto. Incorporators W. W. Wallace and J. J. Carton both of Flint, Mich., and George William McLaughlin of Oshawa, Ont.

The Burlington Metals Co. Ltd., has been incorporated at Toronto, Ont. with a capital of $40,000 to manufacture articles consisting of copper, brass, bronze, iron and steel or other metals. Head office, Hamilton, Ont. Incorporators, Reginald H. Parmenter, Arthur J. Thomson and William Symon Morlock all of Toronto.

The Reliance Foundry, Ltd., has been incorporated at Ottawa, Ont., with a capital of $50,000 to carry on business as general founders, and manufacturers of soil pipes and fittings of all kinds. Head office, Montreal, Que. Incorporators, Emilien Daoust, Antonio Valiquette and Joseph A. St. Yves all of Montreal.

The Hamilton Tar & Ammonia Co., has been incorporated at Ottawa, Ont., with a capital of $50,000 to manufacture chemicals, drugs, oils, ammonia and all chemical by-products of coal, etc., head office to be at Hamilton. Ont. Incorporators, Robert C. Fearman, D. C. R. Martin and A. T. Proctor all of Hamilton.

The White Sewing Machine Co., of Canada, Ltd., has been incorporated at Ottawa, Ont., with a capital of $500,000 to take over the Raymond manufacturing Co. of Guelph, Ltd., also "The White Sewing Machine Co., of Canada at Hamilton, Ont." Head office at Guelph, Ont. Incorporators, Chas. L. Dunbar, Leo W. Goetz and John Sutherland all of Guelph.

Marine

Kingston, Ont.—The Canada Steamship Lines propose building a wharf at the foot of Wolfe Island.

Port Arthur, Ont.—Work has commenced on two steel freighters at the Western Drydock & Shipbuilding Co.'s plant.

London, Ont. — The supplementary estimates include $100,000 for improvements to the London and Port Stanley harbor.

Toronto, Ont.—The Toronto Harbor Commission have received fifteen tenders for the harbor head wall to be constructed in the Bay extending from Brock street to Bathurst street. The cost is estimated at $250,000.

C. N. R. Fleet Sold.—It is reported from London, England, that the Cunard Company has completed arrangements for the acquisition of the Canadian Northern's shipping business. The negotiations have been pending for some time.

Quebec, Que.—Good progress is being made with the graving dock at St. Joseph de Levis. The entrance piers have been completed and the excavation of the ground for the dock itself will soon be commenced. The area to be cleared covers 138,000 sq. ft. and the excavation will be carried to a depth of 60 ft. The dock when completed will be 1150 ft. long by 120 ft. wide at base and 144 ft. wide at the top.

Victoria, B.C.—The American steamship Mariposa, of the Alaska Steamship Company, has arrived at Seattle from Esquimalt, where she has been undergoing extensive repairs at the plant of Yarrows, Ltd. The Mariposa was wrecked last October. Yarrows, Ltd., were awarded the contract covering the reconstruction of the interior cabins and damaged superstructure. The work was completed in several days under the contract time.

Trade Gossip

Galt, Ont. — A local syndicate has taken over S. T. Shimer & Sons' business. The new company will continue to manufacture the "Shimer" cutter heads.

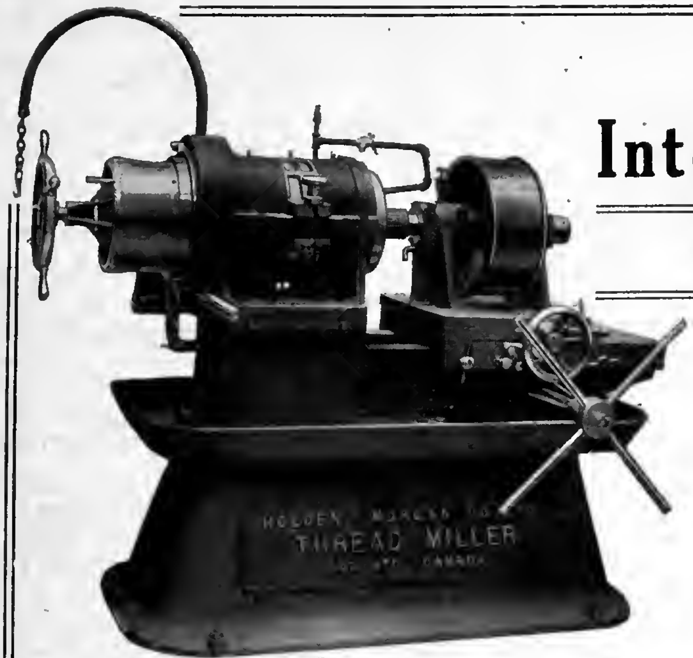
Investigating Steel Industries. — Thomas W. Gibson, Deputy Minister of Mines for Ontario and member of the Nickel Commission, and Dr. Willett G. Millar, provincial geologist for Ontario, have left for Paris to consult the French Government and to investigate the steel industries of France. They have visited the principal refining plants in Britain, including the Mond works at Swansea.

J. D. Lachapelle & Co., 317 St James Street, Montreal, recently sold to the Intercolonial Ry. at Moncton, N.B. a complete electric arc welding equipment of 600 amperes with automatic control panels, also one to the Montreal Cotton Co. of Valleyfield, Que., of 400 amperes with automatic control panels, to be used for general repair work."

The Consolidated Mining & Smelting Co., of Canada, Ltd., has shipped its first car of electrolytic zinc from the nine units of the $1,000,000 plant at Trail, B.C. The other eight units may be in service in the next fortnight. In a short time the daily production will be increased to 50 tons and a gradual further enlargement will ensue up to maximum of 100 tons daily.

G. T. R. Directors.—At the annual meeting of the G.T.R. directors held in London recently, Sir Arthur Yorke, C. B., late chief inspecting officer of railways, Board of Trade, and Stanley Baldwin, M.P., were elected to fill the vacancies, caused by the death of Lord Welby and the resignation of George von Chauvin. The Board of Directors is therefore now as follows: A. W. Smithers, chairman; Sir Henry Mather Jackson, E. J. Chamberlin, president of the company; S. Baldwin, M.P.; J. Brace, W. M. Macpherson, Sir Felix Shuster, Sir H. A. Yorke, and Sir W. Lawrence Young.

Toronto Customs Revenue.—Customs revenue at the port of Toronto continues to increase. The amount for the month of April was $2,767,307, a new high record in the history of the city. As compared with the figures for April last year they show a gain of $1,264,510. The figures for the last six months show a gain of $6,810,912, in compari-



The Holden-Morgan

Internal Thread Millers

Representing 7 in., 8 in. and 9 in. sizes.

The machine illustrated above has for its principle simplicity and perfection, and was designed especially for milling the internal threads on the nose or base of the shell body.

The shell is carried between two conical surfaces in the interior of the mandrel, this ensures the thread being milled perfectly true with the axis of the shell, and holds the shell in a much firmer and truer position than is possible with collet chucks. The master screw is chased on the outside of the mandrel, which entirely precludes the possibility of "drunken threads."

The milling head is carried in movable carriage and both slides are moved up to positive stops and locked so that thread is milled absolutely the same size in every instance.

Each machine is complete with oil-pump and pan.

NOTE—Countershaft is provided with machines over 6 in. size only, as smaller sizes are run direct from line shaft.

	7 in.	8 in.	9 in.
Net weight			3300 lbs.
Weight Crated	(Approximately same as 9 in. size)		3400 "
Weight Boxed			3500 "
Shipping Dimensions			108c. ft.
Time per Operation Threading or Recessing Base	12 mins.	14 mins.	16 mins.
Threading Nose	6 "	8 "	10 "

Code Word			
Base..	Aeves	Abgie	Anin
Nose..	Sevea	Elgha	Nina

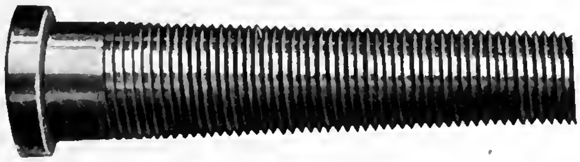
The A. R. Williams Machinery Co., Limited

64-66 Front St. West - - - - Toronto

Taper Threading With a Geometric Die Head is a Simple Matter

The chasers follow the taper of the work automatically, and release the work at the end of the cut. Head is withdrawn without touching the finished threads.

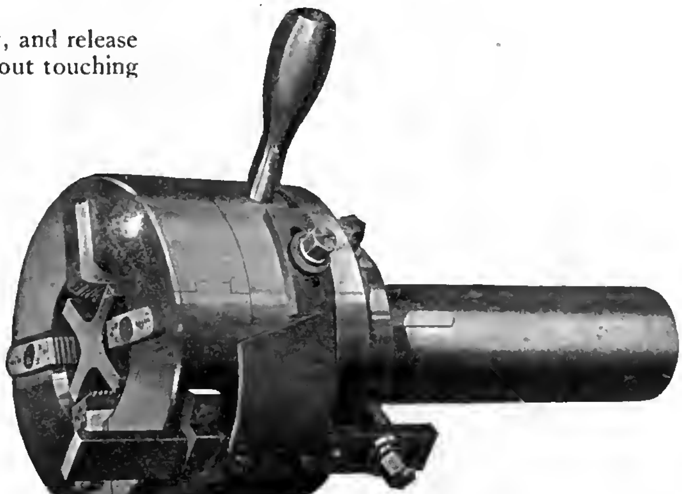
Geometric Taper Threading Die Heads are adapted to Screw Machines and Turret Lathes. When not cutting taper threads, the Head can be removed, leaving the machine free for other work.



Made to order, specially suited to requirements of machine and work.

Employed very generally at present on fuse work.

—Consult us about your taper threads—



A Geometric Taper Threading Die Head.

The Geometric Tool Company, New Haven, Conn., U.S.A.

Canadian Agents:

Williams & Wilson Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

son with figures for the corresponding period a year ago.

Amherst, N.S.—The Ledcote Co., of Canada, Ltd., has taken over a property here and is installing plant for covering sheets, etc., with lead as a substitute for galvanizing. William Knight is president of the concern.

U.S. Copper Supply.—Copper production in the United States, for the calendar year 1915, is given by the Geological Survey at 1,388,009,527 pounds, against 1,150,137,192 pounds in 1914. Refined copper for 1915 is stated at 1,634,000,000 pounds, an increase of 100,000,000 pounds over 1914. Stocks of refined copper on hand: January 1st, 1915, 173,640,501 pounds; January 1st, 1916, 82,210,835 pounds. Copper consumed in 1915 was 1,043,461,982 pounds, against 620,445,373 pounds in 1914.

U.S. War Exports.—Total of war exports in 18 months to February 29, last was approximately $2,000,000,000. Exports of brass during March were about $24,000,000, or nearly four times greater than the total shipments during the calendar year 1914. Arms and ammunition exported during 18 months are valued at more than $250,000,000, including $16,000,000 in firearms, $33,000,000 in cartridges, $2,600,000 dynamite, $84,400,000 gun powder. Exports of 289 aeroplanes were valued at $2,550,000.

Building Notes

Toronto, Ont.—The T. Eaton Co. will erect a large warehouse, three storeys and garage on Teraulay Street, at a cost of $100,000.

Toronto, Ont.—A building permit has been issued by the city architect to E. W. Gillett Co., to erect a grain elevator and mill at Pardee avenue and Liberty street, at a cost of about $13,000.

Toronto, Ont.—The City Architect has approved of the plans for a two-storey brick addition to the Separate school at the north-west corner of Renhold and St. Clair Avenues. The additions are estimated to cost $19,500.

Toronto, Ont.—The City Architect has issued a permit to the Gutta Percha Rubber Co., to erect a reclaiming building at the north end of West Lodge avenue. It is a two-storey brick and steel building, and is estimated to cost $30,000.

Toronto, Ont.—The city architect issued a permit to the Toronto Hydro-Electric System to erect an addition to the transformer station on the south side of Cherry street near Front street. The building is to be of brick, and will consist of three storeys. It is estimated to cost $6,000.

Railways—Bridges

Montreal, Que.—The Montreal and Southern Counties Railway has been intended as far as Granby, Que. This section comprises 54 miles of track and 4 sub-stations.

Halifax, N.S.—A bill is now before the Provincial Legislature to confer power on the Lockeport Transportation Co., to build a railway from Lockeport, to Lockeport Junction, a distance of four miles.

Catalogues

Blowing Engines made by the Nesta Machine Co., Pittsburgh, Pa., are dealt with in a catalogue recently issued. Some large installations are illustrated accompanied by a brief description.

The Vanadium-Alloys Steel Co., Pittsburgh, Pa., have now ready for distribution to the trade, a new folder which describes their Red Cut Superior High Speed Steel. In addition, this pamphlet offers suggestions concerning heat treatment. A copy will be mailed free upon request.

Air Heater and Air Blower.—Bulletin No. 219, issued by the B. F. Sturtevant Co., Boston, Mass., deals with the "Sturtevant" electric air heater and blower. The apparatus is fully described and the various purposes for which it can be used are given in detail. A list of sizes with capacities is included and the illustrations show a few different types indicating their varied application.

Homestead Valves.—A bulletin illustrating and describing various styles of valve made by the Homestead Valve Mfg. Co., Homestead, Pa., has been received. The essential points of these valves are dealt with fully and particularly with regard to the quarter-turn feature of their construction.

Steam Traps.—The George W. Cole Co., Toronto, Ont., have issued a new booklet illustrating and describing their line of boiler feed, return feed, lifting and vacuum traps. The illustrations include a diagram of a double trap installation. Other items include a price list, particulars of the "Cole" oil separator and a list of users of the "Cole" trap. Copies of this booklet may be had on application.

Detroit Stokers is the title of an attractive catalogue being distributed by the Detroit Stoker Co., Detroit, Mich., to feature the "Detroit" automatic mechanical stoker. Excellent illustrations show in detail the construction of this stoker and its principal features; its methods of operation are also described fully. Other illustrations of a similar quality show a large number of typical installations at various power plants. The "Detroit" stoker engine is illustrated and described and some useful efficiency tables, etc., are included.

Steam Saving Devices.—An interesting line of steam saving and protective devices are dealt with in catalogue No. 18 which is being distributed by the Strong, Carlisle & Hammond Co., Cleveland, Ohio. The specialties include steam and vacuum traps, separators, pump governors and pressure regulators, stop valves and engine stops, etc. Each appliance is described fully with special reference to its principal features. Sectional views are given showing the general construction and the method of operations is also described diagrams show some of the specialties installed and price lists with dimensions for the various sizes are included.

Nordberg Oil Engine.—Bulletin No. 27A deals with the high compression oil engine made by the Nordberg Mfg. Co., Milwaukee, Wis. The bulletin describes fully the "Nordberg" oil engine which is of two-cycle type and built in three sizes up to 200 h.p. This engine is claimed to be the simplest oil engine on the market and the principal features embodied in its construction and upon which this claim is based, are described fully. The bulletin contains a number of excellent half tones showing different views of the engine, detail sectional drawings and scavenging cards. Copies of the bulletin may be obtained on application.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

SIX-FOOT METAL PLANER FOR SALE—practically new. Apply A. Graham Boyd, 100 Front St. E., Toronto. (14)

TWO FOX TURRET LATHES FOR SALE—splendid condition. Ideal Foundry, 960 Gerrard St. East, Toronto. Phone Gerrard 1055. (15)

FOR SALE — ONE NEW FORD SMITH Grinder for Shrapnel. A short time ago we purchased five, find four will take care of our work. The National Manufacturing Co., Brockville, Ont.

1—2-SPINDLE SHAPER, WOOD TOP, JOHN Ballantyne, Preston, make. used two months. 1 Dynamo, 45 lights, Toronto and Hamilton Electric Co. make. Used five months. Good as new. Box 195, Jordon, Ont. (R.T.F.)

FORD-SMITH NO. 2 PLAIN MILLING MAchine; new; in perfect condition; ready for immediate shipment. McGregor & McIntyre, Ltd., 1139 Shaw St., Toronto. (16)

FOR SALE—FIFTEEN HUNDRED GALLON Duplex Steam Pump, used sixty days. Size twenty x twelve x sixteen stroke. Apply Fraser & Chalmers of Canada, Limited, Montreal. (12)

FOR SALE—GARAGE IN GOOD WHEAT district. Snap for a good, practical man. About forty cars in vicinity. Will sell cheap if taken at once. Address Box 74, Hanley. Sask. (13)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London. Ont.

1—C.G.E. TYPE 10—20 H.P. INDUCTION Motor—60 cycles, 220 volts, 45 amps.—1200 R.P.M., complete with Auto Starter. Pulley on Motor 12" Diam. x 10" Face. Cummer-Dowswell, Ltd., Hamilton, Ont.

FOR SALE—ONE NEVER-USED WESTINGhouse Motor, Type CCL, 5 H.P., 200 Volts, 16 Amperes, 3 Phase, 3000 Alts., 700 R.P.M., full load, equipped with starting compensator and frame and 6" pulley with 5" face. Canadian Machinery, Box 189. (16)

FOR SALE—PLANING MILL AND FACTory, doing good business. Terms $2,000.00 cash. Balance to suit buyer. Address O. Ribble, Bronte, Ont. (13)

FOR SALE — TWO GOLDIE-McCULLOCH Wheelock Engines—cylinders 16" diameter, 38" stroke; both engines now running, but will be replaced with Hydro-Electric. Engines guaranteed to be in perfect condition, and will be sold complete with belt wheels, one 14' x 35" face and one 12' diameter with 24" face, also belting if required. Canadian Consolidated Felt Co., Berlin, Canada. (19)

Machine Shop For Sale

IN MONTREAL

21 Machines adapted to shell work

$25,000 (19)

Box 187, CANADIAN MACHINERY
263 St. James St., Montreal

FOR SALE

FOR SALE—1 CLEVELAND ACME MAchine Co.'s 6" Cap, Single Head, Tapping Machine—back-geared, automatic feed, cone step pulleys and countershaft with two extra chucks. Particulars from Taylor-Forbes Company, Limited, Guelph, Ont. (13)

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double bandsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

ELECTRODES — THE PROPRIETORS OF letters patent No. 127080, relating to "Process of manufacturing iron for use in alkaline accumulators," and No. 127081, relating to "Active masses for positive electrodes of electric elements, etc.," desire to dispose of the patents or to grant licenses to interested parties at reasonable terms, with a view to the adequate working of the patents in Canada. Inquiries to be addressed to the actual proprietors, Svenska Ackumulator Aktiebolaget Jungner, Stockholm, Sweden. (13)

SITUATIONS WANTED

CHIEF ENGINEER — 26 YEARS' EXPERIence. Factory and Central Station, Alternating and Direct Current, Gas or Steam Engines, efficiency guaranteed, own instruments, best of references. Box 181, Canadian Machinery. (12)

AS MAINTENANCE ENGINEER OF FACTory, power or lighting plant, where economy is a factor, wide experience, best of references. Box 180, Canadian Machinery. (12)

REPAIRING

ALL KINDS OF MACHINERY REPAIRED, rebuilt and installed. W. H. Sumbling Machinery Co., 643 Yonge Street, Toronto, Ont.

SITUATIONS VACANT

WANTED—YOUNG MAN TO HANDLE ADvertising of a line of engineering equipment. Must be prepared to locate in a city of 15,000 population. Salary to start, $70 per month. Box 184, Canadian Machinery.

WANTED — MACHINISTS AND FLOOR hands on heavy and miscellaneous medium work; steady employment, modern shop, good wages. Apply, stating age and experience, P.O. Box 6, Walkerville, Ontario. (6)

WANTED — TWO FIRST-CLASS STEEL moulders. Apply Nova Scotia Steel & Coal Company, Limited, Sydney Mines, N.S. (15)

WANTED—OUTSIDE MACHINIST TO ACT as mechanical foreman on construction work. Apply to A. B., Canadian Machinery. (15)

WANTED — YOUNG CHEMIST WHO HAS had some experience in analysis of iron, steel and other steel plant products. Apply to X. Y., Canadian Machinery. (15)

WANTED

Burned out Tungsten Lamps, late type, drawn wire, 25, 40, 60 and 100 Watts, 110 and 115 volts.

DOMINION TUNGSTEN LAMP FACTORY
ST. CATHARINES, ONTARIO

WANTED—FIRST-CLASS BOILER MAN TO take charge of battery of water tube boilers, 1200 H.P., which will be increased. Should be familiar with steam engine and air compressor. Reply, giving particulars of experience and salary expected, Box 191, Canadian Machinery. (19)

WANTED

WANTED BERTRAM WAVING ATTACHment for 4.5 Shells, with or without Lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jameson Limited. (R.T.F.)

WANTED—HYDRAULIC PUMP, GOOD FOR 2,000 lbs. pressure capacity for 16" diameter cylinder press; belt-driven preferred. Canadian Consolidated Felt Co., Ltd., Berlin. Canada. (18)

ENGINEER WANTS AGENCIES FOR MONTreal and district. Side line or specialties, on commission basis. X.Y.Z., Canadian Machinery, Montreal. (19)

WANTED — BERTRAM WAVING ATTACHment for 4.5 shells, with or without lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson, Limited, Hamilton, Ont. (rtf)

Manufacturers Attention!

Practically new, solid brick plant, one story, situated in Toronto. Height 57 feet and covering 10,000 square feet, with additional land of 16,000 square feet. Frontage 100 feet by 260 feet depth. Has its own railroad siding. Equipment already installed $20,000. This plant is situated in a locality where workmen could be easily secured. Owner would like to hear from firms contemplating opening in Canada. Would take active interest in company.

Apply Box 194
Canadian Machinery

Is preceeded p. 409 79

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, MAY 11, 1916 No. 19

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 22 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

The Forging and Machining of 60 Pounder Howitzer Shells

Staff Article

Where circumstances have permitted the combination of forging and machining operations under one management, it has been productive of satisfactory results, not only to the management of the particular plant involved but to other factories depending on such a plant for their supply of forgings. Difficulties in machining, due to defective forging or peculiarities in steel composition are more promptly and efficiently remedied when the forging plant is in close contact with the machine shop as in the plant described in this article.

THE work involved in the complete manufacture of a shell from iron ore to the stage where it is ready for receiving the explosive charge, includes operations of widely different natures, requiring plant and equipment of such variety that only in a few cases has it been possible for firms in the country to do such work in its entirety. Quite a number of concerns, however, have undertaken the work of forging in conjunction with machine work with beneficial results to the shell output of the industry as a whole.

In the case of the plant, the layout of which is shown in Fig. 1, arrangements were made for producing forgings for 4.5 in., 60 pdr. and 6 in. shells, and also for machining a portion of the output of the two smaller sizes. The 60 pdr. constituted much the greater proportion of the work machined and the plant is an interesting example of continuous operation from forging to finishing under one management and one roof, the shipping of the finished shells being done within a stone's throw of the point where they are forged.

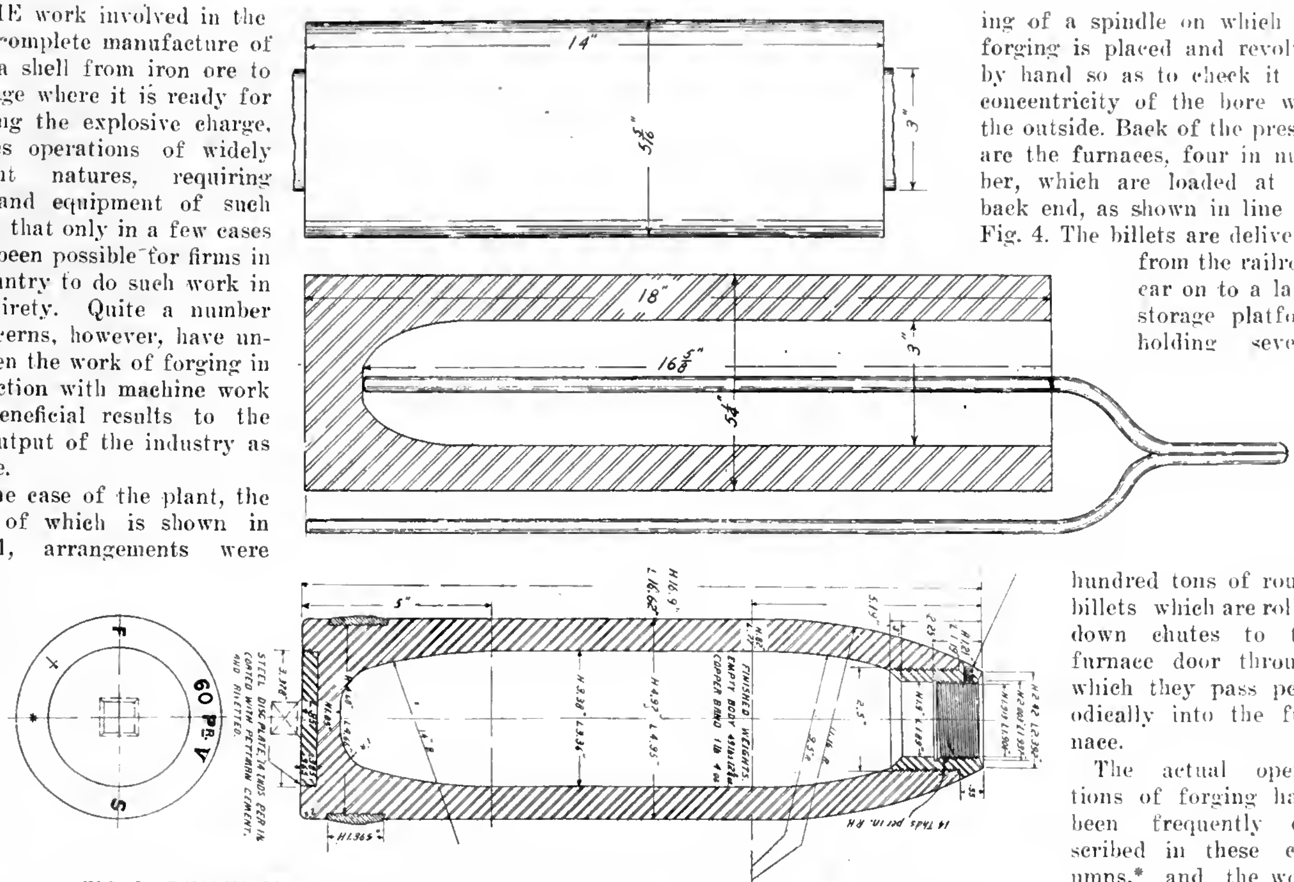


FIG. 2.—DIMENSIONS OF 60 PDR. SHELL IN VARIOUS STAGES OF COMPLETION.

In Fig. 2 are shown three sketches, the upper one giving the dimensions of the rough billet as received from the steel mills, the centre one showing the rough forging as delivered to the machines, and the lower one the finished shell as shipped from the machine shop to the loading plant. The forging operations on the billet are simple compared with the numerous machining operations, but the simplicity is more than offset by the powerful presses and heating furnaces necessary for the handling of the work.

A general view of the forging department is given in Fig. 3, which shows the forgings cooling off in front of the presses while to the left of the picture are a couple of testing fixtures consisting of a spindle on which the forging is placed and revolved by hand so as to check it for concentricity of the bore with the outside. Back of the presses are the furnaces, four in number, which are loaded at the back end, as shown in line cut Fig. 4. The billets are delivered from the railroad car on to a large storage platform holding several hundred tons of rough billets which are rolled down chutes to the furnace door through which they pass periodically into the furnace.

The actual operations of forging have been frequently described in these columns,* and the work as done here is in very close accordance with the best practice at present existing. Referring to Fig. 1, the left hand press is constant-

*See Canadian Machinery, Jan. 27, Manufacture of Shell Forgings.

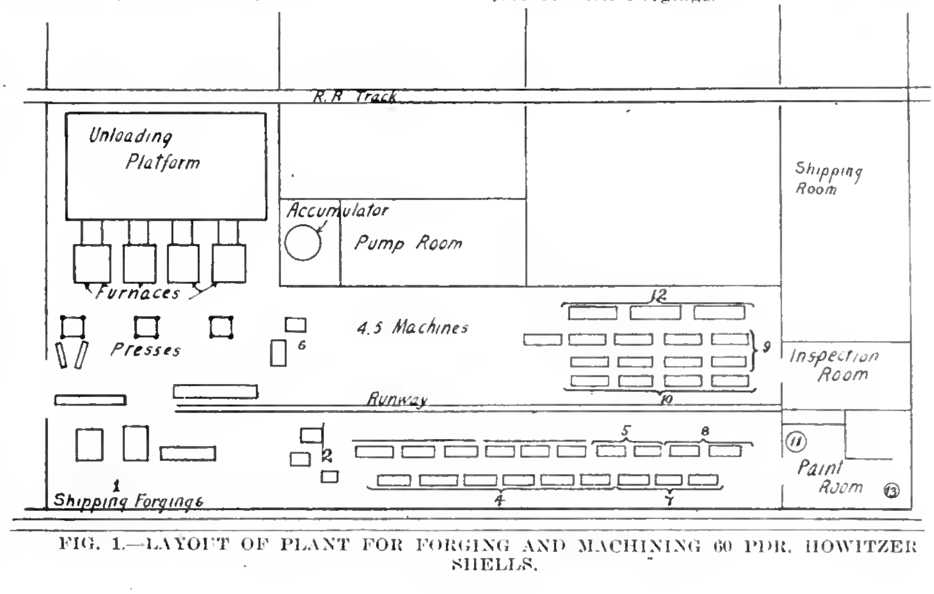


FIG. 1.—LAYOUT OF PLANT FOR FORGING AND MACHINING 60 PDR. HOWITZER SHELLS.

ly engaged on 4.5 shells, performing the work in one stroke. No drawing properly speaking is done on the shell, as the

FIG. 3.—GENERAL VIEW OF SHELL FORGING DEPARTMENT.

billet is placed in the die, and the piercing punch forced down into it with the consequent upward extension of the metal out of the die. The return stroke of the press withdraws the punch after which the hot forgings are removed from the die by means of suspended tongs, see Fig. 5, and deposited in gravity conveyors which carry them to the cooling bed. The press illustrated is equipped with two punches and dies so as to make use of the full power of the press.

60 Pdr. Forgings

The work of producing 60 pdr. forgings is divided between the other two presses which are equipped with single punches. The centre press is used for piercing only, which operation is practically identical with that just described. The pierced billet is now ejected by means of knock-out gear which forces up the bottom of the die, and is immediately placed in the end furnace at the right where it is again brought up to forging heat to be followed by drawing down to size in the third press. This is done by bringing down the press so that the point of the punch exerts a certain pressure on the bottom or pocket of the shell which is supported on a die plate held over the opening of the main die. After this pocket is formed, which is done in a few seconds, the punch is drawn up a short distance to allow the die plate to be withdrawn, when the punch is forced downwards through the main die, the tapering bore of which reduces the outside of the forging to the required size.

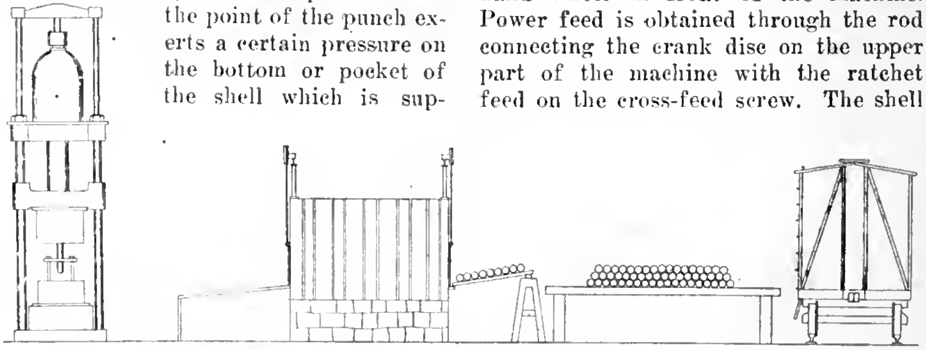


FIG. 4.—ILLUSTRATING CONTINUOUS PROGRESS OF WORK FROM FREIGHT CAR TO FORGING PRESS.

The hot forgings are piled up in batches as shown so that cooling takes place very slowly minimizing the possibility of hardening. When cool enough to handle, the forgings are checked up for overall length and depth by means of a simple gauge as shown in Fig. 2 centre. After being checked for concentricity on the fixtures previously referred to, the forgings are taken to the cutting-off department where the bases are faced off to thickness and the open end trimmed to length.

Cutting Off

The machine illustrated in Fig. 6, is a Kennedy double-end, four tool machine which operates on both ends of the forging simultaneously, the two tools at each end being located opposite each other and fed into the work by the large hand wheel in front of the machine. Power feed is obtained through the rod connecting the crank disc on the upper part of the machine with the ratchet feed on the cross-feed screw. The shell itself is held in a double ended hollow chuck encircled by a spur driving ring the whole being mounted in suitable framing. The handwheel to the left of the machine is geared to a rod which is moved to a certain position every time a new forging is placed in the chuck, and locates the job from the inside of the base, being withdrawn when cutting off commences.

In addition there are two Hall machines of standard type, one facing bases and the other trimming mouths.

This particular plant was fortunate in securing uniform equipment in the matter of machine tools, with the accompanying benefits resulting from the interchangeability of small tools, and the certainty with which operators could change over on machines when required, without reduction of output due to strangeness in handling different machines.

Boring

Machining the bore is done after cutting-off, six 30 in. American lathes being in use. These are fitted with plain and substantial turrets which carry four tools arranged as shown in Fig. 7. These are used in rotation as numbered, i.e..

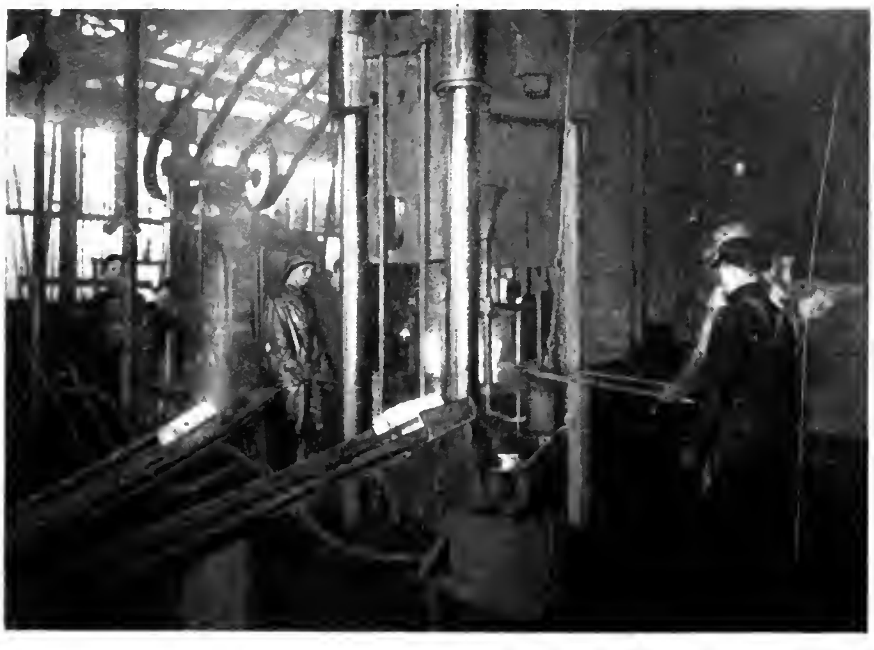


FIG 5. FORGING 4.5 IN. SHELL BLANKS IN A PRESS EQUIPPED WITH DOUBLE PUNCHES. HOT BLANKS TRAVELING ON GRAVITY CONVEYOR.

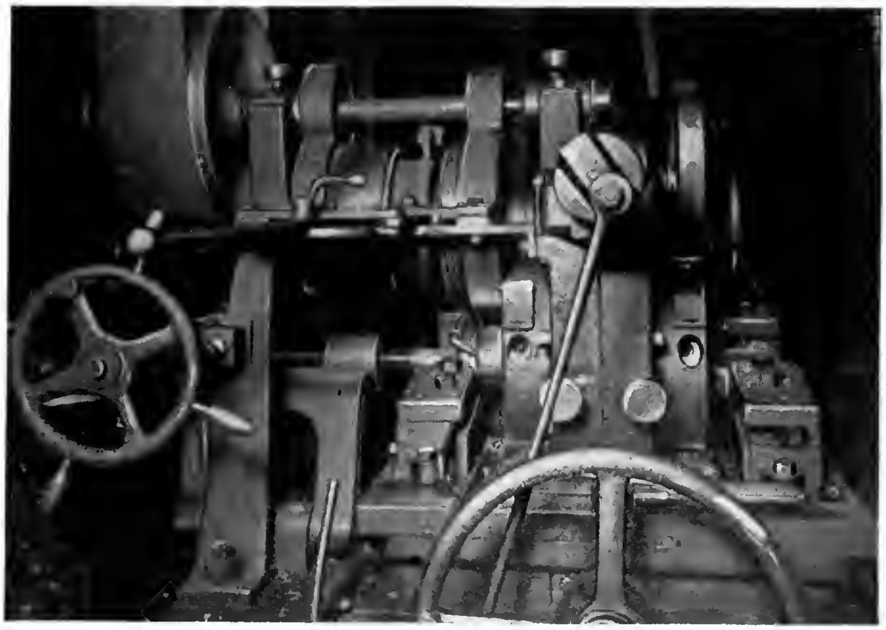


FIG. 6. FOUR-TOOL CUTTING-OFF MACHINE OPERATING ON BOTH ENDS OF SHELL SIMULTANEOUSLY.

rough bore, rough bottom, ream bore and bottom, and bevel mouth. The finished bore of the shell is now used to locate the work on an expanding arbor.

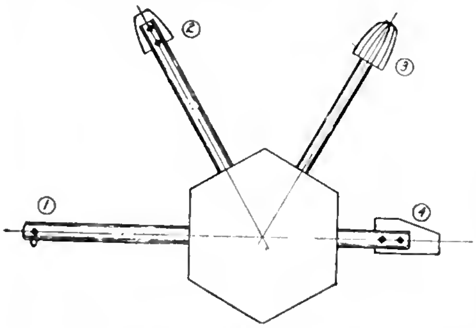


FIG. 7.—ARRANGEMENT OF BORING TOOLS IN LATHE TURRET FOR MACHINING 60 PDR. SHELLS.

when the base or outer end is turned down to size to receive support from a cup centre carried in the tailstock spindle. The support derived from this now enables the outside of the forging to be rapidly reduced to rough finished dimensions, a slight increase in diameter at the mouth being obtained through the use of a forming bar controlling the slide rest. This work is also performed by six 30 in. American lathes, one of which is illustrated in Fig. 8.

Two 30 in. Bertram lathes take care of the grooving and waving, after which a slight nosing-in or bottling of the open end is performed in the conventional manner with a hydraulic press, followed by machining the nose which consists of boring, tapping, facing the end, and blending the interior curve of the nose into the parallel wall of the shell. This latter work is done on three 30 in. American lathes with turret carriages similar to those already mentioned.

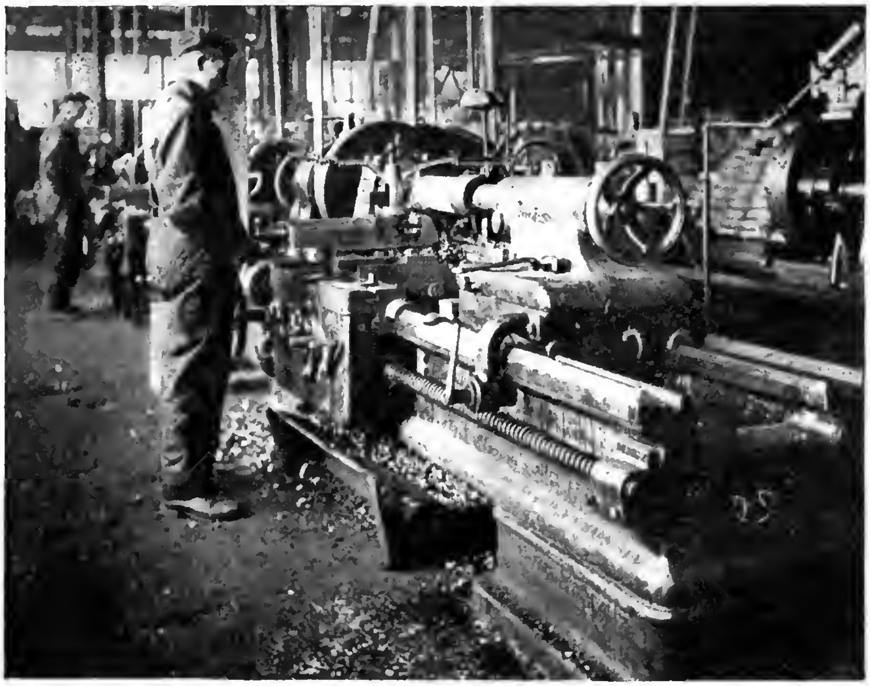


FIG. 8. 30 IN. ENGINE LATHE ROUGH TURNING OUTSIDE OF SHELL.

Recessing

Two other similar machines are engaged continuously in recessing the base, the tools used for this work being simple in design and efficient in practice. The recessing tool is shown in Fig. 9, being ground to shape from a round bar, and fed straight into the base as shown in the sketch at the right. The manner of forming the cutting edge enables the tool to be moved to or from the centre to adjust the diameter and carry the cut fully across the centre of the recess. Final sizing is done by a fluted reamer of regular type. No threading is done in the recess as the base plugs or gas checks are riveted in with pneumatic caulking hammers which tighten up the joint in a satisfactory manner.

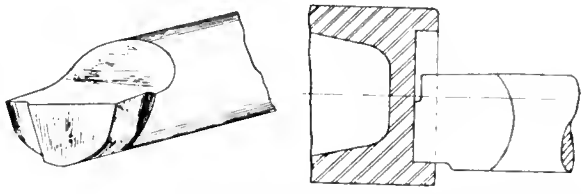


FIG. 9.—SIMPLE TYPE OF TOOL USEDIN RECESSING BASE FOR PLUG.

The excess metal of the base plug is now faced off to size, after which the shell is finish turned to size and profile. Nine C.M.C. 18 in. lathes are devoted to this work, the shell being driven by the base in a simple collet type of chuck and the nose supported by the tailstock centre in a service plug. A profile bar arranged in conventional manner, controls the tool slide so as to impart the desired shape to the nose of the shell.

After being thoroughly cleaned and examined, the shell is weighed and as the various dimension limits have been worked to so as to have the shell slightly overweight, it is a simple matter to remove this extra weight from the base The shell is driven by a threaded arbor in the nose, and the base end supported in a steady rest, four C.M.C. 18 in. lathes being utilized for this work and facing off the rough base plates.

Marking and Banding

These operations are performed in the same machine, which is of the pneumatic type and was designed and built in the shop, see Fig. 12. The machine is here shown marking the base of 60 pdr. shells, the various letters being held in position in a plate above the inverted shell, the

FIG. 10. GENERAL VIEW OF MACHINE DEPARTMENT.

FIG. 12. SHELL BANDING PRESS WHICH IS ADAPTED FOR MARKING THE BASES ALSO.

nose of which rests in a suitably shaped die, which in turn is forced upwards with considerable pressure by a large diameter piston working in the cylinder underneath the table. The operator's right hand is on the end of a long lever which operates the controlling value in the air pipe just above his foot. When used for compressing the copper driving bands , the supporting die is removed and the shell allowed to descend to a point where converging jaws are brought to bear on the band, these jaws being forced toward the centre by a series of radial toggle levers.

Final Operations

Two C.M.C. 26 in. lathes fitted with Bertram attachments now machine the bands to size and profile, after which the shells having passed final inspection are lacquered, baked and painted, the final work being the fitting of the shipping plugs and packing the shells in regulation shipping boxes. The painting is done on a special machine shown in Fig. 13. Temporary plugs in the nose of the shells allow them to be set on tilting studs, so as to be revolved by friction drive from the large diameter plate in the centre of the machine. The paint pot is supported on a swinging support which allows the operator to move round the machine. When a shell is painted it is swung out of contact with the driving plate and is then easily removed, to be placed in the drying racks at the left of the picture, these being heated by hot air.

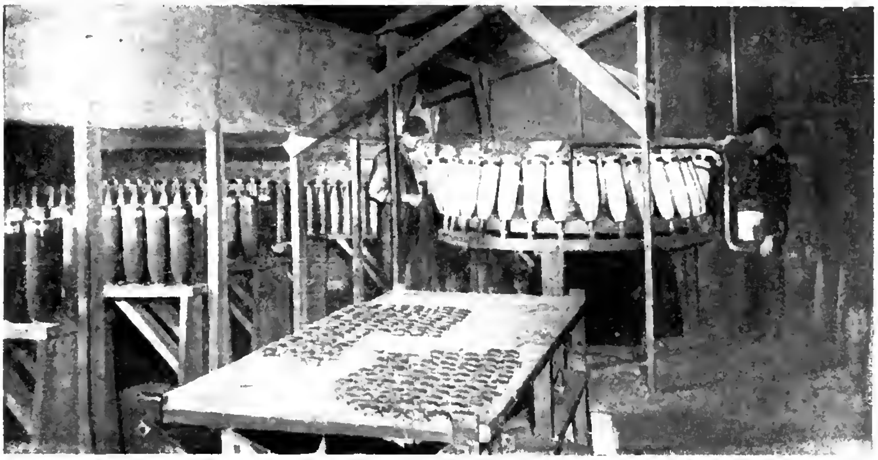


FIG. 13. SHELL PAINTING MACHINE WITH MULTIPLE FRICTION DRIVE.

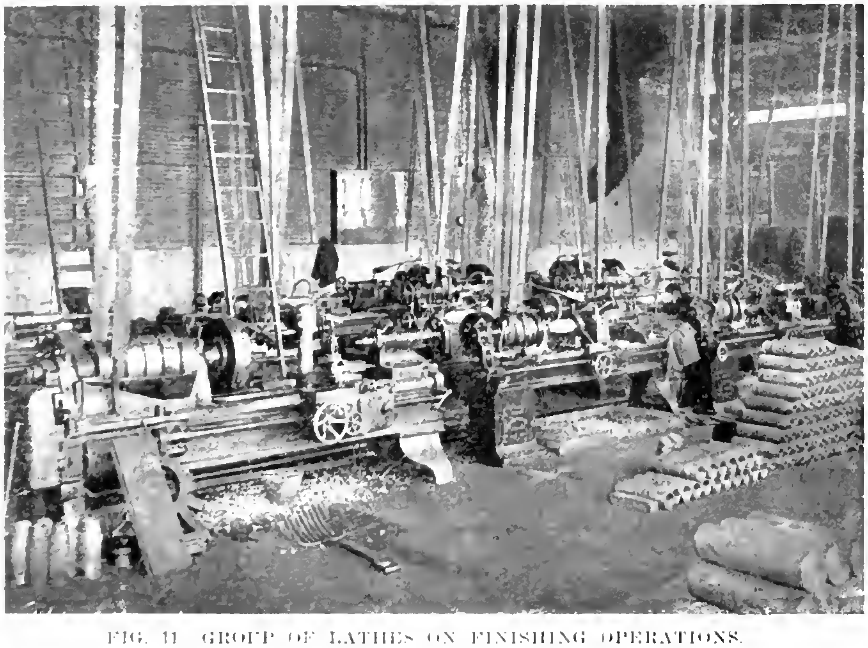


FIG. 11 GROUP OF LATHES ON FINISHING OPERATIONS.

War Trade Committee.—With the object of assembling and collating information bearing upon the new trade situation created by the war, the Dominion Government has appointed a war trade committee. It is to be purely interdepartmental and wil consist of Sir Joseph Pope, under-secretary of State for External Affairs; John McDougald, C.M.G., commissioner of customs; F. C. T. O'Hara, deputy minister of Trade and commerce, and one other, the committee having power to enlist the co-operation of certain other officials.

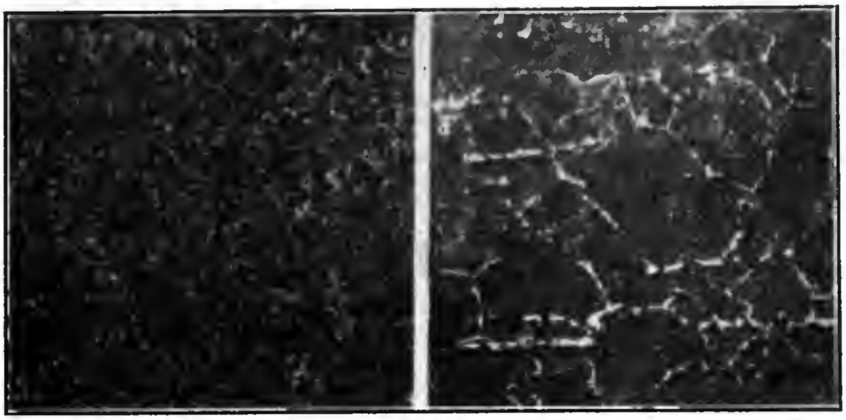
EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

HEAT TREATMENT OF STEEL

By "Melter"

AT the moment, when the majority of manufacturers in the mechanical trades are engaged in turning out munitions of war it may be of interest to explain the "why and wherefore" involved in the heat treatment and working of alloy, and steel materials. Primarily a comprehensive understanding of the fundamentals of metallurgy must be acquired and the success of the practical results obtained will largely depend on the degree of knowledge attained in this very important branch of mechanical engineering.



A—UNANNEALED. B—ANNEALED.
Magnified 50 Diameters.

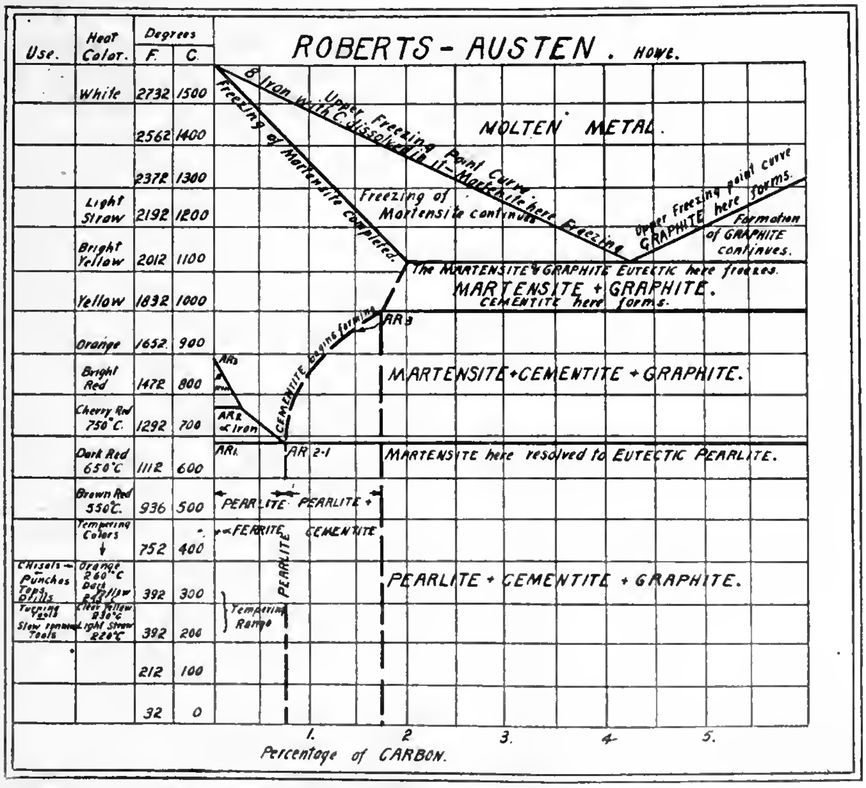
Steel-Making Processes

Steel should be considered first as it is the product most widely used. It is principally made by four different methods—Bessemer, Open Hearth, Crucible and Electric. The Bessemer process is not very largely used now except for special purposes—as making sheet metal. The Crucible process is extra and more expensive than Open Hearth or the Bessemer and the product is used where an extra fine material is required such as for tools or dies. Electric processes are rapidly emerging from the experimental stage, but the product is still somewhat expensive.

The Open Hearth process is used in making steel for shrapnel shells. It is the most widely used of all processes, and while there has been a lot of discussion as to whether the acid or basic open hearth process is the better for all practical purposes there is no vital difference. Results of exhaustive published tests have shown acid open hearth to be slightly the superior.

The qualities of the steel which may be in use do not therefore depend so much on the type of furnace used in the manufacture, as on the ingredients in the steel and the way in which the steel is manufactured.

Carbon is the most important element, as on the quantity of this element, and the state in which it exists, depends the distinction between wrought iron, cast iron and steel. Wrought iron is pure iron (or ferrite as the metallurgists call it) crystallized in many shapes and forms. In addition to ferrite there are elongated particles of slag. Low carbon steel is wrought iron without the slag and in addition to the ferrite there is a little more carbon. Now carbon does not exist as carbon but combines with the iron forming a carbide of iron, and it is on the state of this carbide that all the properties of steel depend. This carbide when combined with ferrite in segregated areas and not disseminated through the mass as it is in mild steel is called pearlite from its appearance under the microscope.



ROBERTS-AUSTEN DIAGRAM ILLUSTRATING EFFECT OF HEAT ON IRON WITH VARYING PERCENTAGES OF CARBON.

Carbon may be introduced into steel up to a certain point when all the ferrite will have combined with it and the whole will be pearlite (as it is in tool steel). If still more carbon be introduced there will be an excess of the carbide. This saturation point occurs when about 0.8 per cent. carbon has been absorbed.

Effects of Heat

The results obtained by heat treatment are caused by critical changes which occur within certain narrow temperature limits. These limits are called calescent points sometimes written Ar. 1, 2, 3, and Ac. 1, 2 3 and represent points where definite charges take place. These changes are chemical structural, and physical, and when the temperature is ascending the pearlite becomes broken up, it's carbides going into solid solu-

tion in the ferrite. It will be noted that some steels have more than one of these points if reference be made to the Roberts Austen Diagram.

The term annealling means breaking up these dissolved carbides and distributing them through the mass, and to do this properly, slow cooling from slightly above the decalescent point is necessary. If on the other hand steel is heated above these points where all the carbides are in solid solution and cooled very quickly a new state of matter is obtained. It is this new molecular formation called Martensite which imparts the hardness to steel and by referring again to the diagram it will be seen just how high a temperature must be attained for varying amounts of carbon to obtain a certain structure. It must be borne in mind however, that if it is desired to anneal or harden steel it must be heated just above the critical temperature. The higher it is heated above this point the courser will be the grain. Slow and undisturbed cooling from just above the critical point produces the finest grain.

Photograph A. shows a piece of steel heated considerably above the critical temperature and B. shows a piece cut from the same bar, heated just above the decalescent point and allowed to cool slowly.

To sum up:—1. Steel heated above the critical point has the finest possible structure at that point, but the further it is heated beyond it the larger the grain size.

2. For any given temperature above the decalescent point, a certain grain size is normal.

3. When cooling occurs after being overheated, the grain is not reduced in size and in order to make any change in the structure the steel must be reheated slightly beyond the decalescent point.

Influence of Carbon

As we have seen from the above that the qualities of steel depend largely on the treatment and state of the carbon it may be of interest to look at Table 1 where the results are given of tests with varying percentages of carbon, on commercial bar steel made in Canada.

Table 2 gives results which demonstrate clearly the great benefits which may be obtained through suitable heat treatment.

TABLE 2.—EFFECT OF HEAT TREATMENT.

Carbon	Manganese	Heat Treatment	Elastic Limit	Elongation in 2 inch	Reduction in area
.05	.05	None	32,020	42.5	53.8
.18	.40	Annealed	39,460	35.0	62.6
.18	.40	Heated 1650)) Oil quenched .... Drawn 750)	45,390	33.0	64.6
.18	.28	Annealed	43,010	34.0	63.4
.26	.28	Heated 1650)) Oil quenched .... Drawn 975)	52,230	28.0	65.3
.35	.50	Heated to 1500-1550 ....)) Drawn 600 to 1200 ....)	45,000 to 80,000	....	....

The rate of quenching has a very important bearing on the physical properties, for if the cooling is not rapid we do not obtain the desired martensite but an intermediate structure which is not so hard.

Quenching Mediums

Experiments have shown that different quenching mediums give different degrees of hardness, tensile strengths, tc.

Effect of different oils on pieces cut from shrapnel shell forgings.

Carbon %	Tensile strength lbs. per sq. in.	Elongation in 2 in. %	Kind of Oil.
.32	129,000	16	Seal oil
...	118,000	20	Rape oil
...	134,000	18	Seal oil
...	125,000	20	Rape oil

The oils used showed the following physical properties:

	Viscosity at 60° F. Saybolt seconds	Specific gravity
Seal oil	131	.924
Rape oil	261	.915

The desired effects of quenching mediums seem to be better obtainable from those liquids which possess high specific gravity, low viscosity and the power of creating as little vapor as possible thus allowing the liquid to be in more intimate contact with the steel, and exert its cooling effect more efficiently. The size of the test piece has an important bearing on the results obtained. In commercial practice very often the time is not taken to heat a piece slowly, uniformly and for a sufficient period for the heat to soak into the center of piece without overheating the exterior.

Some tests have shown that when the work has been proceeded with on a commercial scale, even with the greatest care there will be a variation of as much as 33 per cent. from results obtained with a half inch diameter and a 1¾ in. diameter test piece. Consequently if a larger piece of steel is to be used a higher and more careful heat should be given.

Temperature and Mass

Recently published results of investigations give some interesting data on the effect of temperature and mass. These results show that for each increase of 1-16 in. diameter the temperature should be increased 5 degrees. Some heading and indenting punches for brass cartridge cases were made of 1.25 per cent. carbon steel, water quenched, but the metal took a permanent set under working conditions so that the only way in which results could be obtained was to build up the punches with 1 in. thick sections bolted together. This effect of treatment on mass causes specifications to call for location of test pieces as is done in shrapnel cases. For example nose of shell being of a different thickness to body, the heating temperature and effect of quenching medium would give different results.

The effect of overheating mild steel shows that for the first 100° F. overheat there is a reduction in foot lbs. resistance on an impact test, of 50 per cent., and for each further increase in temperature of 100° there is a reduction of 60 per cent., 90 per cent. and 99 per cent.

TABLE 3.—EFFECT OF HOT WORK AND QUENCHING ON MILD STEEL.

Treatment	Tensile strength lbs. per sq. inch	Elongation in 8 inch
Normal	55,000	13%
Worked at 1150° F. air cooled slowly	65,000	13%
Worked at 1300° F., quenched and annealed at 900° F.	66,000	12%
Worked at 700° F., cooled slowly	75,000	6%
Worked at 950° F., quenched water	98,000	11%
Worked at 1300° F., quenched brine	120,000	1%

TABLE 1.—COMMERCIAL BAR STEEL WITH VARYING PERCENTAGES OF CARBON

Carbon	Phosphorous	Manganese	Sulphur	Tensile strength lb. sq. inch	Elongation in 8 inch	Reduction in area
.11	.04	.51	.03	56,300	28.1	56.8
.15	.05	.48	.04	62,900	26.5	46.0
.16	.03	.40	.03	58,800	28.1	46.3
.18	.02	.55	.03	60,000	26.5	46.6
.24	.03	.46	.02	66,000	21.8	40.3
.24	.03	.39	.02	62,800	21.8	45.7
.26	.03	.49	.03	67,000	23.3	44.0
.37	.05	.45	.02	65,700	25.0	44.5
.24	.04	.56	.02	74,500	18.7	35.0
.27	.05	.51	.03	71,300	15.6	38.0
.41	.01	.56	.02	76,400	21.8	43.7
.38	.02	.57	.03	75,000	17.9	36.6
.50	.02	.55	.03	86,600	19.5	36.6
.50	.02	.50	.03	86,300	18.7	33.0
.53	.05	.53	.03	102,200	14.0	17.3
.55	.02	.69	.03	103,800	10.9	17.3
64	.03	.65	.02	127,200	3.1	....

Effect of Hot Water and Quenching on Mild Steel

Great care should be taken in handling steel at a blue heat, say 400° to 650° F. for it has been proven when elongated 1.7 per cent. that the brittleness has been increased 33 per cent. Table 4 shows some interesting figures on tests made at different temperatures.

TABLE 4.—HOT AND COLD TESTS ON IRON AND STEEL.

Material	Temperature	Diameter	T/s lbs. per sq. in.	Reduction in area	Elongation in 8 in.
				Elongation	Reduction
Mild steel	0° F.	1"	61,700	53.05%	27.05
"	70° F.	1"	61,100	53.90%	31.40
"	360° F.	1"	57,300	54.70%	28.00
"	0° F.	1⅛"	61,450	63.20%	31.20
"	70° F.	1⅛"	60,500	62.75%	32.50
"	360° F.	1⅛"	57,900	64.15%	12.25
Iron	0° F.	1"	53,800	42.30%	27.50
"	70° F	1"	52,250	45.05%	29.80
"	360° F.	1"	49,000	41.75%	20.25
"	0° F.	1⅛"	53,800	29.50%	21.25
"	70° F.	1⅛"	52,950	43.20%	28.50
"	360° F.	1⅛"	49,850	44.50%	24.80

PIECE WORK SYSTEMS—II.

by R. R. Clarke

IN the foundry, bases for three different system of piece-work arrangement are practicable, namely: Set day's work and proportionate increase in daily earnings for increase in output; set price per flask and set price per individual pattern.

Remunerating IncreasedDay Work Output

The first-named system retains features of the day-work idea. In foundries employing it moulders are usually paid so much money for so many hours' work, as for instance $3.60 for 9 hours, the management stipulating that so many, say 10 flasks or pieces, off a certain pattern constitute a 9-hour day's work. The moulder is at liberty to reduce the time in making these castings to whatever figure he is capable or to increase the number of pieces or flasks when demands in the foundry justify regardless of the number of hours falling within the prescribed figure. Following out this system moulders make what they term a day, a day and a quarter, a day and a half, etc. This system is extensively used and finds its most useful application where the larger castings are ordered in extensive quantity. It is, however, more or less limited in application, and not an entirely satisfactory universal system. In a jobbing shop where small and mixed work in erratic quantities predominates, its use presupposes more or less difficulty.

Price Per Flask

The price-per-flask system is kindred in execution to the set day's work method. It consists in fixing the price on a basis of flask dimension as for instance a flask 16 in. x 16 in. x 10 in. deep over all would pay 20 cents; 24 in. x 24 in x 12 in., 30 cents etc.

Such a system has been tried and discarded by more than one firm. Its chief difficulty consists in the fact that it determines wages on the basis of sand handled rather than amount of castings produced. Especially is this true in the mixed work. The loss in metal melting is a feature of brass foundry operation sufficiently important to warrant that every gate be made to produce its maximum of casting output. This gate remelting loss constitutes a necessary evil in consequence of which the wide-awake foundryman will reduce this loss to a minimum by making every gate used produce its full quota of merchantable castings.

And therein is discovered a serious weakness of the price-per-flask system. Moulders will not take sufficient interest in filling the flask to its pattern capacity unless constantly watched and constant watching breeds constant trouble. We know of one foundrry where the contention arising from this feature alone became so monotonous that the system was abandoned. In the sum-total of the day's work the man's worth is the quotient arising from a division of his production into his wages regardless of sand handled and the failure of this system to take care of this feature is sufficient evidence to warrant serious consideration beore adopting it.

Price Per Individual Pattern

From these systems and their difficulties we turn to a consideration of a more congenial practice, namely, the price-per-individual-pattern method. This to our mind is the all around logical system. It consists in determining the price per casting from a consideration of its size, weight, and moulding complexities, and paying for those castings only which satisfy the reasonable demands of a close inspection. It puts the question of wages, output, and casting and gate melting loss fairly and squarely up to the man. If good, he will make good, and if not the firm will have little to regret at his departure. It is the practicability of universal application along with the incentive given the man to produce to full gate and flask capacity good, solid, castings that recommends this system to preference, it of course being understood that all opposition will be courteously yet firmly silenced.

This system, employed in a very progressive foundry known to the writer, and to the maximum of advantage is subject to the following method of control: First, the patterns, all of which are given designating numbers, are taken from their recorded placement, tagged with a service tag, and then given to the moulder who preserves the tag keeping his daily record on the back thereof. On his daily and dated service card the moulder states the number of pieces made from each pattern and computes the earnings of each, totalling the amount thus computed on the bottom of his card. He then signs his card and deposits it in the office at the end of each day.

From each days' card a daily and dated inspector's card is made, recording each man's work, and then handed to the inspector who counts and inspects the castings, placing the amount of good castings found opposite the amount the moulder claims to have made. Completing this card, the inspector shows each moulder his itemized account to acquaint him with his loss and then hands the card back to the office clerk. From the amount found, the clerk notes any and all differences between that and the amount claimed, computes the value of these differences and adjusts the service card correspondingly. In executing this method it might be well to remark that clear and concise records of all piece-work prices are kept, that the prices put on the card by the moulder are carefully checked against these records and that the computations on all cards are carefully gone over to detect and adjust any errors that may have occurred thereon. It might be of interest to remark further that the complementary systems in this foundry are so perfected that each day's work is cleaned up and taken to the shipping room by afternoon of the day following its making, thus eliminating all possibility of getting one day's work mixed up with another.

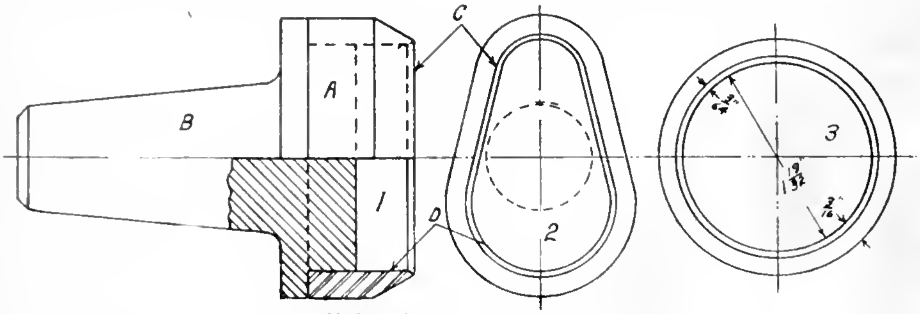
As to the qualifications of the inspector our notion is that he should be a moulder or one acquainted with the principles of the trade, thus enabling him to give just decisions on the cause of defect in castings, and to arrive at the seriousness of the defect through the auxiliary knowledge of any error in making. A heavy scale on the side or bottom of a casting when chipped off may evidence no surface defect, yet the moulder knows that sand dislodged therefrom is somewhere hidden in the casting. The quantity of dirt, the position of casting and the vicinity of clean metal demanded will be more accurately determined and mean more to the trade-knowing man than to one not acquainted therewith, howsoever bright he may otherwise be.

AN ODD-SHAPED PUNCH

By J. R. Hamilton.

WHEN a number of odd-shaped holes are required to be punched or cut in thin sheet metal, it is often a very expensive and tedious operation to perform with a small chisel. If there are only a few, this method may be very satisfactory; and on the other hand, if there are a great number, it may be profitable to construct a special punch and die. However, in some instances the number is not sufficient to repay the cost of a punch and die, and where the opening is small it is often advisable to construct a special punch that will insure the holes being of uniform size and shape.

The accompanying sketch shows the method adopted in making a small hand punch to cut an opening in tin, of a shape shown by the line C. It was decided to make a cast steel ring and shrink it on a machine steel shank. By carefully measuring the outline of the opening it was found to be approximately 5.3 inches. The diameter of a circle of this circumference would be 1 22-32 inches. Allowing an inner bevel of 3-64 inch, as shown at 3, the internal diameter of the ring would be 1 19-32 inches.



AN ODD-SHAPED PUNCH.

The ring was then turned in the lathe to the required dimensions and bevels, and afterwards heated and formed to shape. The shank was then shaped and filed a little large for the shaped ring. The ring was then finished and hardened and forced on while at the redrawing temperature. Several similar punches were made in this way, and proved very efficient.

EXTINGUISHING SMALL FIRES FROM PETROLEUM SPIRIT, ETC.

THE British Fire Prevention Committee have recently carried out a series of tests, the results of which tend to prove that sawdust intimately mixed with bicarbonate of soda and applied in bulk has certain advantages over sand and similar materials as an extinguishing medium for comparatively small fires occasioned by the ignition of the vapor of petroleum spirit (petrol) and other inflammable liquids.

When sawdust is applied to the surface of a liquid it will float for some time thus excluding the oxygen of the air and smothering the fire. Ordinary sawdust, as obtained from sawmills, is the most suitable for this purpose. It must be free from shavings and chips of wood, but it does not require to be either specially dried or to contain added moisture. The addition of bicarbonate of soda although not essential is advantageous. Under the action of the heat from the burning liquid, carbonic acid gas is given off from the bicarbonate of soda adhering to the floating sawdust and accordingly close to the source of the fire. The gas given off under such circumstances slightly assists in extinguishing the fire.

An effective proportion of bicarbonate of soda to sawdust is 10 lb. to 1 bushel (or, say, 20 lb.) of sawdust. Any form of bin, such as a dust-bin can be used, but a specially suitable bin can be made of sheet iron, 24 inches square, 3 feet 6 inches high, 18 inches square on top, the sides sloping slightly. The top should be arranged for filling purposes, and at the bottom of one side there should be provided a hinged door 16 inches wide and 21 inches deep. Such a bin would hold about 8 bushels, and it should be kept in a convenient and easily accessible position as near the petroleum spirit, etc., as possible. The mixture to be thoroughly effective should be applied not only in bulk but rapidly and systematically, the object being to produce what may be termed a lateral "curtain or scythe effect.

MAXIMUM PRICES OF IRON IN GREAT BRITAIN

THE question of the price of material used and produced in Britain's iron and steel industries has been under the consideration of the minister of munitions for some time part; and, after consultation with the representatives of the principal trade associations, the following maximum prices for the various products have been fixed until June 30, 1916, and thereafter until further notice.

The makers may sell for delivery after June 30, 1916, on the understanding that the fixed maximum prices ruling on the first day of any month during the period of the contract will apply to all deliveries made during that month. These maximum prices are based upon the abnormal costs and conditions now prevailing, and must not be assumed to be indicative of any difference in relative values which may have obtained in the several districts before the war and may obtain again after the war. This intimation must not be taken to authorize any sale or purchase or other dealing prohibited under the Defence of the Realm Regulations:—

CLASSIFICATION

Per Ton Net F.O.T. Makers' Works.	£	s.	d.
Hematite Pig-Iron (West Coast)			
Mixed Nos. 1, 2, and 3	6	7	6
Special quality, containing under 0.03 of phosphorous and sulphur	6	15	6
Special quality, containing under 0.02 of phosphorus and sulphur	7	0	0
Hematite Pig-Iron (East Coast):			
Mixed Nos. 1, 2, and 3	6	2	6
Special quality, containing under 0.03 of phosphorus and sulphur	6	15	6
Special quality, containing under 0.02 of phosphorus and sulphur	7	0	0
Hematite Pig-Iron (Scotch):			
Mixed Nos. 1, 2, and 3	6	2	6
Special quality, containing under 0.03 of phosphorus and sulphur	6	15	6
Special quality, containing under 0.02 of phosphorus and sulphur	7	0	0
Hematite Pig-Iron (Welsh):			
Mixed Nos. 1, 2, and 3	6	2	6
Special quality, containing under 0.03 of phosphorus and sulphur	6	15	6
Special quality, containing under 0.02 of phosphorus and sulphur	7	0	0
Lincolnshire Pig-Iron			
Basic or foundry	4	7	6
Cleveland Pig-Iron:			
Mixed Nos. 1, 2 and 3	4	2	6
Northamptonshire Pig-Iron:			
Forge	4	2	6
Foundry numbers	4	5	0
Derbyshire Pig-Iron:			
Forge	4	5	0
Foundry numbers	4	7	6
North Staffordshire Pig-Iron:			
Forge	4	10	0
Foundry	4	12	6
Basic	4	15	0
South Staffordshire Pig-Iron:			
"Part Mine" forge	4	10	0
"Part Mine" foundry	4	12	6
Common Staffordshire	4	5	0
"All Mine" forge	5	10	0
"All Mine" foundry	5	15	0
"Warm Air" forge	7	0	0
"Warm Air" foundry	7	10	0
Special quality, Lord Dudley's silicon	7	17	6
Cold-blast iron	8	17	6
Scotch Foundry and Forge Pig-Iron			
Nos. 3, 4 and lower grades of Monkland, Dalmellington, Eglinton, and Govan	5	14	0
Nos. 3, 4 and lower grades of all other brands	5	15	6
No. 1 quality	In all cases to be 5s. per ton above these prices.		

The administration of the South African Railways has decided to provide a new erecting shop at Salt River, near Cape Town, at a cost of approximately $115,000. This will enable the heavier type of locomotive now in use to be handled with greater expedition. Machinery and plant will be required for the engine shops.

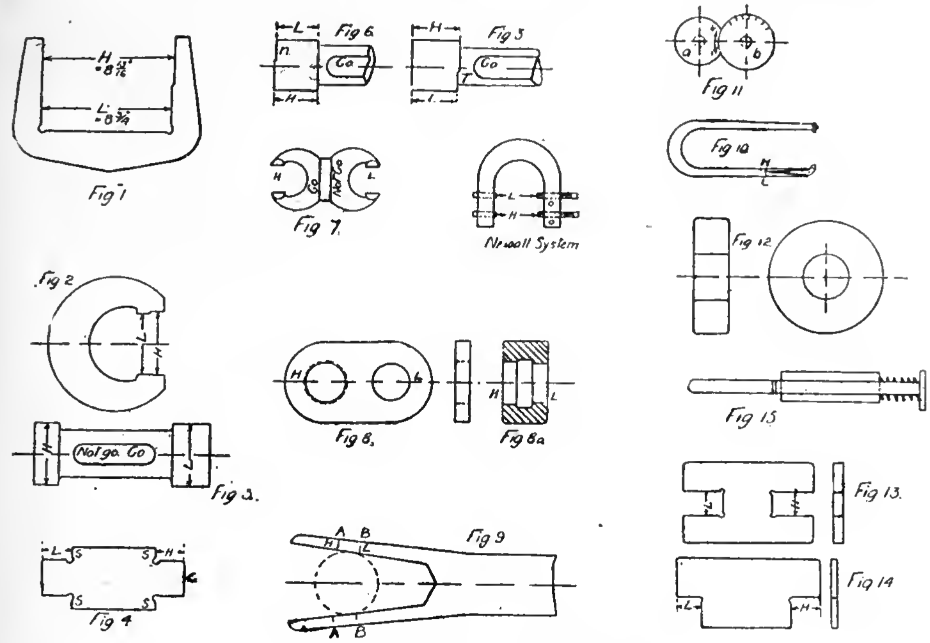
NEW PROCESS DEVELOPMENTS

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

LIMIT GAUGE PRINCIPLES AND PRACTICAL APPLICATIONS—III.*

By W. H. Booth

As to material of gauges, this may be of cast iron, especially in large sizes. Hard tool steel may be used for small gauges, especially if these be unhardened screws. Drop forgings of mild steel are much used, and so are gauges cut of plain flat plates. Mild steel gauges are finished somewhere near to size, and are then subject to a case-hardening process on the gauging parts. Enough only is left to grind and scrape to a true finish. Cast iron has the advantage of cheapness and also of brittleness, breaking if allowed to fall on the floor, and so avoiding a possible large



LIMIT GAUGES FOR VARIOUS SERVICES.

number of spoiled pieces of work which may follow upon a fall on its edge of a more malleable gauge of mild steel, and a consequence of a slight change of form.

It should be possible to cast iron gauges in a chill, or to cast them in dies, so that any little grinding will finish them within the thickness of the chilled surface. Cast gauges should be suitably tumbled so as to remove any tendency to change form from the influence of internal stresses. The same may be said of drop forged steel, for a drop forged steel gauge will begin to move from the first, and will move for two years before settling down to a fixed size.

In gauge-making, there must be no attempt to close or open the jaws of a gauge by light tapping or opening with a hammer. This sets up surface stresses, and the rough hands of a workman very speedily grind away the surface and relieve the stresses, and the gauge moves at once. These small movements only become of importance in the case of fine work requiring fine limits and small tolerances. They are mentioned to show how special the work of a gauge-maker has become. They at least justify the manufacturer to stock large quantities of the more usual types of gauges so that the final finish can be added after at least the greater part of the stress movement has taken place.

Like all other articles of commerce, gauges must be made in quantities, and the gauging parts machined together, the jaws of a number of gauges being milled out while the gauges are fixed and clamped side by side in a jig, in which also they must be ground nearly to the finishing dimension. Cylindrical gauges cannot so be made, for they must be turned and ground as separate units, and usually they are more costly because of this more individual treatment.

Measuring Large Holes

For measuring larger holes, instead of discs being employed, the spherical end measuring rod is much used. A rod of this description is finally ground to length in a machine in which the rod is rapidly rotated upon its longitudinal axis, and the frame which carries it is given a rocking movement in the horizontal plane, the end of the rod being presented to a rotatory grinding disc. Thus, a 1-ft. spherical end measuring rod is part of a 12-in. sphere cut through its centre. Its advantage is that it finds its true place in gauging a bored hole, and there is far less liability to error than when a pointed rod is used. End rods vary from 1/4 in. to 3/4 in. diameter according to the diameter of the holes to be gauged. They are also usable to check lengths where it is possible to set their ends to a square projecting from the line of measurement.

In Fig. 8 is seen a very usual form of double-ring gauge. In grinding these in a lathe the piece is out of balance, and must be balanced by adding a weight. In many instances such a gauge would be better made to the form Fig. 8a.

Fig. 12 is the usual form of standard or one-dimension ring gauge. Fig. 13 is a cheap form of thin plate gauge for measuring diameter or breadths and lengths. Fig. 14 is a depth gauge more often used with the dimensions across the wide piece, and in double form, back to back—for gauging the depth of recesses. Fig. 15 is a depth gauge with a moving spindle to show depth by means of lines placed across the spindle, as shown, for certain conditions of visibility, or otherwise modified to suit the purpose in hand.

There is no particular art in devising a limit gauge beyond the selection of the dimensions on the piece to be gauged, so that the number shall be a minimum, and yet no required dimension shall be wanting. A good designer will, as far as possible, lay out his designs to involve a minimum of gauging. For this reason, when a design has been evolved for any piece of work, it does not follow that the drawings will best fit shop conditions, and in the best conditions of manufacture it may be necessary for a special man to redraw the work without changing any part of the design in respect of centres or parts which move together. In a general way, that design is best which can be made with a minimum of dimensions on the drawing.

As a broad principle, the gauging of a machine consists in determining the distances apart of the centre points. Details are separately gauged for diameter and thickness. Many parts need no gauging; they are finished from fine castings and cannot go wrong. Small parts made on automatics are beyond gauging, except for an occasional test of one part in each few hundred, so as to indicate any departure from truth.

*From a paper read before the Association of Engineers-in-Charge.

Designing Gauges

There is a special art in designing gauges so that they shall produce the class of work required. This requires a knowledge of shop work and of the class of work required. Considerable judgment is needed to fix the limits so that results are satisfactory. One item alone need be named to show the difficulty which may arise. It often happens that, for two parts which have to work or fit together, the limits from the nominal sizes may be so wide, compared with the fit diffierence, that the maximum dimension which the smaller piece may receive will actually be greater than the minimum dimension of the larger piece. Thus a shaft or spindle may come out larger than the bore for wheel which is to run on it.

This point has already been alluded to, and is one which will become over-prominent when the workmen are unaccustomed to the limit principle, and, as they always will do, insist on working right up to one limit. It is for this reason that special insistence is laid on workmen acquiring as soon as possible the courage of their skill. When they have acquired this, it will rarely happen that well-designed gauges, even with crossed or overlapping limits, will give non-assembling results. Some little selective assembly may be occasionally desirable, but there will be little absolute rejection of parts.

APRIL RAILROAD RETURNS

COMPLETE RETURNS of the gross earnings of the three big Canadian rail roads in April show extremely satisfactory conditions, the aggregate being the largest of any month so far this year and the gain over the corresponding month a year ago the largest, both actual and percentage, yet reported in 1916.

Owing to the fact that Canadian Northern returns now include figures which were kept separate from the system's earnings up to last summer, too much is not to be made of the fact that the April total this year is the largest ever reported for the three systems combined. What is clear is that, with due allowance for the difference in the C. N. R. figures, April 1916 gave results about midway between the totals of April, 1912, and April 1913, when a new stage in the expansion of Canada was culminating. Taking the figures as available the $18,077,805 total for April this year compared with $13,118,678 in 1915, $15,417,367 in 1914, $17,906,556 in 1913 and $16,882.202 in 1912.

Grand Trunk earnings in April this year exceeded those of the same month in either 1912 or 1913, C. P. R.'s were about $400,000 to $900,000 less. C. N. R's ran about $1,100,000 to $1,200,000 higher, but then, as already noted, they take in figures from a part of the system not included in the 1912-13 period.

Total gross earnings of the three systems combined, through April are tabulated below:

Week	Earnings.	Increase.	P.C.
First	$4,314,486	$1,083,166	33.5
Second . . .	4,270,405	1,241,047	40.9
Third	4,036,961	1,101,889	37.5
Fourth . . .	5,455,953	1,533,025	39.1
Total . . .	$18,077,805	$4,959,127	37.8

URANIUM IN TOOL STEEL

THE latest development in the tool steel industry, says the Iron Age, appears to be the application of uranium as an alloy in varying quantities. In the accompanying table is shown a number of comparative tests of tools made from uranium high-speed steel as compared with regular high-speed steel. The tools marked U are uranium steel tools; those marked B, C and D are regular high-speed steels. The tests were made under the direction of the Standard Chemical Co., Pittsburgh, at the works of the Mesta Machine Co. and other large users of tool steel. All uranium tools were ½ x 1½ in., except No. 8-U, which was 1 x 2 in. The standard tools were all of larger sizes, the smallest being 1 x 2 in.

GLAZING OF GRINDING WHEELS

WHEEL glazing is one of the commonest troubles the grinding wheel user has to meet. A wheel glazes when the points of the abrasive grains wear flat without the surrounding bond being disturbed. Its causes and remedies are as follows:

Wheel too hard for the work in hand, therefore dressing is only a temporary remedy. A softer wheel must be used to cure it effectually.

Wheel running too fast; having the effect of making the wheel appear harder. The speed should be altered to between 4,000 and 6,000 revolutions per minute.

Too much surface contact between wheel and work; therefore, if possible the work should be jockeyed in front of the wheel so that at any one moment a small surface only is presented to the wheel.

Not enough pressure of work on wheel; requiring in consequence more pressure so as to disturb the bond and dulled grit.

Using wheels bonded with rubber, cement or shellac where such bonding is not desirable; the only remedy being frequent dressing, if impossible to change the wheel.

Variation in hardness of material being ground; this is unavoidable and the only remedy is dressing as required.

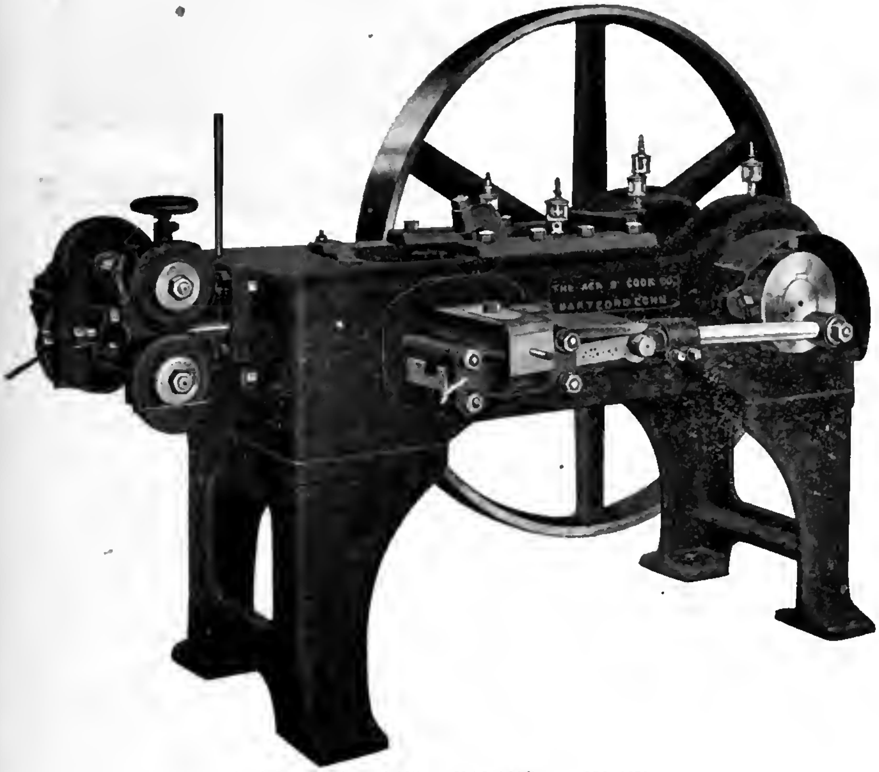
Tool	Feed, In.	Speed, Ft. Per Min.	Depth of Cut, In.	Remarks
Cutting 0.50 per cent. carbon 12-in. shaft:				
No. 1-U	1/16	75	¼	Went over once distance of 14 in. On second lay went 3 in.
B	1/16	75	¼	Went distance of 4 in.
D	1/16	75	¼	Went distance of 1 in.
Cutting 8-in. shaft 7 ft. 5 in. long:				
No. 1-U	1/16	51	⅝	Went over twice. Cut changed to ⅜ in. on second turn.
C	1/16	35	⅝	Did not go 1 in.
Cutting 6-in. shaft:				
No. 1-U	1/32	75	⅝	Ran 18 in.
No. 2-U	1/32	75	⅝	Ran 13 in. Speed increased to 90 ft. per min. and ran 11 in. Tool still good.
B	1/32	75	⅝	Ran 11 in.
Cutting 10-in. shaft:				
No. 4-U	1/16	60 to 65	⅝	Went 8 in.
No. 2-U	1/16	65	⅝	Went 4 in. Speed increased to 80 ft. per min. and went 3½ in.
No. 1-U	3/64	55	5/16	Went 16 in.
B	3/64	55	5/16	Went 2½ in.
No. 5-U	3/64	55	5/16	Went 15 in.
Cutting 12-in. shaft 22 ft. long:				
No. 8-U	1/16	45	⅝ to ¾	Ran 87 in. Most of time the nose of the tool was right on scale.
Cutting 12-in. forging:				
No. 8-U	1/16 to 1/10	38	15/16	Went 127 in. Time, 3 hr. Speed increased to 65 ft. per min. after tool had gone 105 in.
No. 8-U	1/16	60	1 1/16	Ran 12 in.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

SOLID DIE RIVET HEADING MACHINE

THE illustrations show a solid die header or rivet machine and a patented friction feed for the wire used in such machines. The Asa S. Cook



SOLID DIE RIVET HEADING MACHINE.

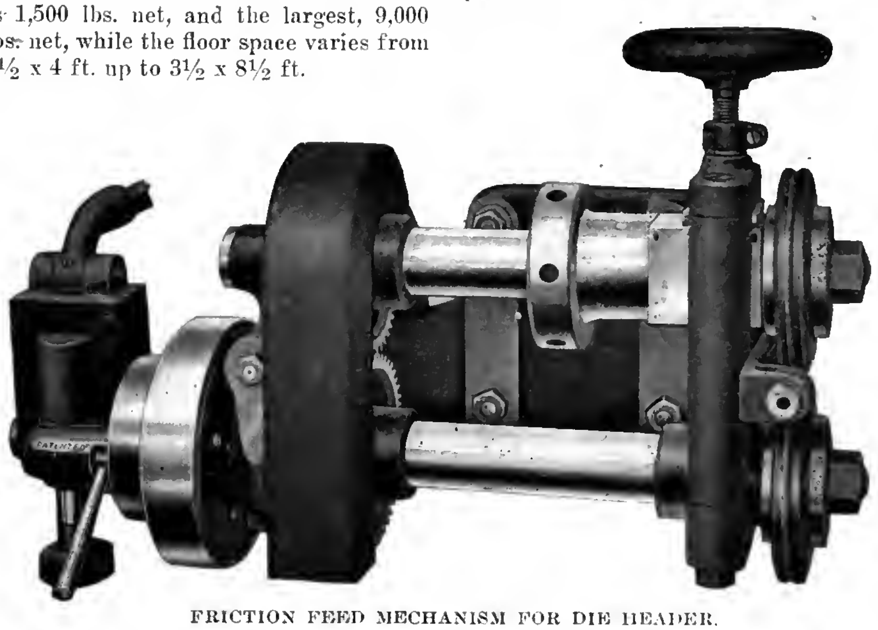
Co., Hartford, Conn., builds a line of five of these machines, which are used principally for making round, oval, filister or similar shaped heads, which are produced in finished sizes and do not require subsequent trimming or shaving.

The production capacity on solid die machines is 150 per min. for the smallest header and 60 per min. for the largest, the diameter of wire varying from 1-16 in. to 7-16 in., and the length fed from ¾ in. to 3 in.

By means of the friction feed, the operator is enabled to regulate—while the machine is in motion—the amount of stock necessary to make a full head without any fin or flash on the edge of the head, and to make a full perfect head so long as the punch and dies are in good condition. By doing so, the pressure on the punch and dies is reduced to a minimum, resulting in their life being much longer. In the case of the blank sticking in the dies, there is no chance of breakage, as the friction is adjusted so that it will slip in case of unusual strain.

Advantage over the ratchet type of feed is claimed, because the circumference of a ratchet wheel cannot be equally spaced for different lengths of blanks or rivets with consequent waste of stock. The heading machine is so constructed that the cut-off does not work while there is still any pressure on the punch.

The weight of the smallest machine is 1,500 lbs. net, and the largest, 9,000 lbs. net, while the floor space varies from 2½ x 4 ft. up to 3½ x 8½ ft.


FRICTION FEED MECHANISM FOR DIE HEADER.

CENTRIFUGAL LUBRICANT PUMP

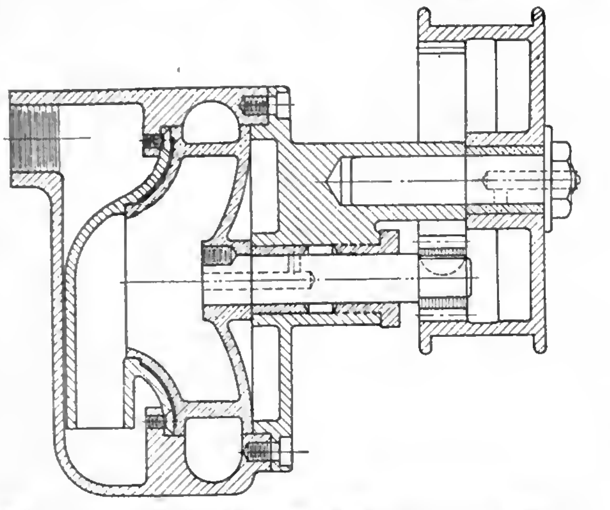
THE peculiar requirements of machine tool lubricant pumps, i.e., ample volume of fluid without unnecessary pressure, are satisfactorily fulfilled by the Fulflo lubricant pump which has been placed on the market by the Cincinnati Lubricant Pump Co., Cincinnati, O.

The pump is of the centrifugal type, and is of compact design, possessing a capacity, according to speed, from 5 gallons per minute at 250 revolutions, to 18


CENTRIFUGAL LUBRICANT PUMP FOR MACHINE TOOLS.

gallons at 400 revs. per min. Increased flows or heads may be had by increasing the speed. As shown in the line drawing, the construction is very simple, the only working part in the liquid being the impeller, which is of such a shape that chips, grit, and other foreign substances pass through freely without detriment to the efficiency of the apparatus.

As a result of the free passageways, it is not necessary to use strainers with this pump, and the manner in which the internal suction pipe is inverted provides a trap arrangement which acts as a self-primer, thus dispensing with the use of check valves, etc., the only valve of any kind used in connection with it being the stop-cock, with which the operator controls the flow on the work, the centrifugal principle allowing the pump to adjust itself to any variation in flow without the use of a relief valve.



CONSTRUCTIONAL DETAILS OF PUMP SHOWING DETAILS OF GEAR DRIVE AND STUFFING BOX ON IMPELLER SHAFT.

STEAM SOOT BLOWER ARRANGEMENT

A SYSTEM for removing soot and fine ashes from the heating surfaces of vertically baffled water-tube boilers, and based essentially upon projecting powerful oscillating steam jets into, through and laterally across the spaces between the horizontal rows of tubes in planes parallel to the pitch of the tubes, is now being offered by the Bayer Steam Soot Blower Co., of St. Louis, Mo.

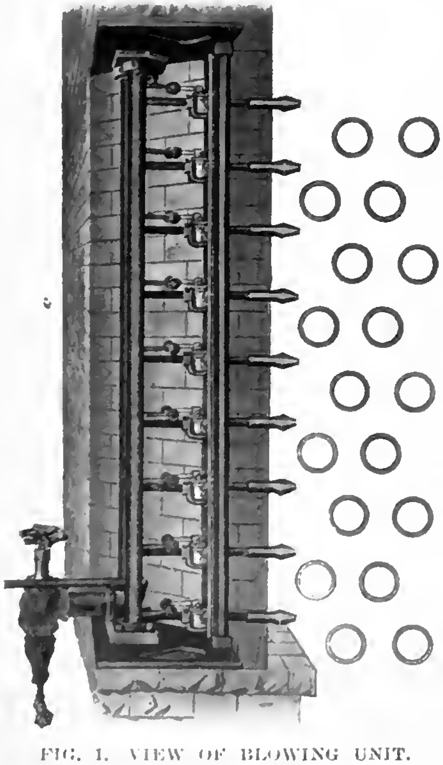


FIG. 1. VIEW OF BLOWING UNIT.

The soot blower has been so designed that the parts can be placed without changing or cutting brick work and walls, the original cleaning openings and internal wall angles in the side of the boiler being ample to permit a wide swing of the nozzle heads. The nozzles are divided into groups or individually controlled blowing units, Fig. 1, each of which served a gas pass or compartment, and is fitted into the cleaning pockets originally provided along the side wall for hand cleaning. The individual units receive their steam from a supply line passing below the blowing units, and having a drain at the lowest point to permit the removal of any possible condensation just before each blowing operation.

The action of the jets through their direct force and expansion of the steam is to create intense momentary drafts that loosen the objectionable particles and push and pull them out of the gas passages into the stack. The method of imparting oscillation to the nozzles will be understood from Fig. 2. Each blowing unit has a riser connected to the steam line, and controlled by its own valve. Short branches extending inward from the riser connect the riser with swing joints, the moving members of which are connected through nipples to the three-way nozzle heads within the furnace wall. A vertical rocking shaft located at the side of the riser connects with the moving members of the swing joints through sets of links and levers. By rocking the shaft alternately from right to left, the entire series of nozzle heads is swung back and forth, the steam being delivered in three separate powerful jets from each nozzle which agitate and remove the soot and ash deposit.

The type of swing joint used, in addition to permitting easy installation, inspection and overhauling, may be brought squarely up against the cover shield which closes the cleaning pocket, and is tilted to the same pitch as the tubes. This permits the steam to sweep at all points within the plane spaces between the tubes, which is essential to thorough cleaning. The swing joints are bolted to a metal cover shield which fits against and is clamped to the two strips on the wall plate, the cleaning pocket being thus permanently air-tight. The unit is located when the shield is clamped into place. Adjustment of the units in permanent position can be completed while the boiler is in service, and the rest of the installation is merely a matter of piping.

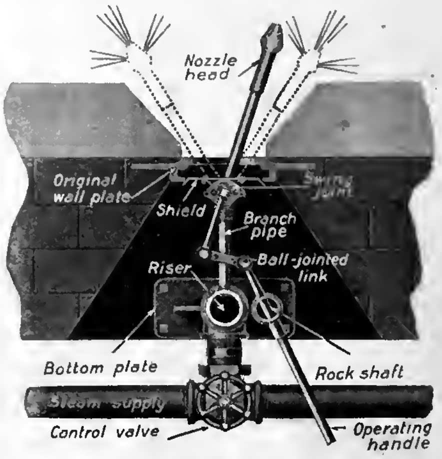


FIG. 2. MECHANISM FOR OSCILLATING BLOWER NOZZLES.

STIMULATING PRODUCTION OF FORMER GERMAN MADE GOODS

INTIMATION was made in Parliament on May 6, by Sir George Foster, Minister of Trade and Commerce that he had effected arrangements with the British Government to place on exhibition at Toronto under the auspices of the Canadian National Exhibition next autumn an important industrial feature. Britain, the Minister said, had been exhibiting a large collection of goods of German and Austrian manufacture for the purpose of stimulating the production of such goods within the Empire. The exhibit would demonstrate the kind, quality, and cost of articles largely supplied by Germany before the war.

Sir George also asked the passing of an item of $150,000, to be used in carrying out his plan of trade extension previously outlined. There would be additional trade commissiosers, one in Petrograd; one in Omsk, Siberia; one in Italy, and two other sub-commissioners were being trained for service. A trade commission of six members would visit England, France, Belgium, and Italy. The commission would be accompanied by representatives of large interests.

The war had shown the need for trade research. The sources of research in Canada were both public and private. Universities, manufacturing enterprises, and private investigations were at work.

The MacLean Publishing Company
LIMITED

(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON. J. H. RODGERS.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. MAY 11, 1916 No. 19

SHELL-MAKING AND ITS INITIATORS

THE proceedings of the Meredith-Duff Commission, covering the investigation of fuse contracts placed by the Canadian Shell Committee in the United States, are being followed with keen interest, and in no section of Canada's many-sided industrial life more so than by that of her metal-working institutions. What has already transpired indicates clearly that however much maligned the manufacturing members of the Shell Committee have been, or to what extraordinary extent imputation as to their self-interest has been pressed, no vestige of proof to warrant same has yet been forthcoming. As a matter of fact, we are constrained to believe that the investigation will not only have the effect of showing that these men have been patriotic above most, but will demonstrate our Captains of Industry to be head and shoulders above politicians and others of that ilk in straightforward dealing, and that it is a moot point whether in attending to their country's or its Empire interests they may not have made over much personal sacrifice. In one respect the latter is true, for taking into account the abuse heaped upon them during the past twelve months or so, this alone —which it unfortunately is not, were enough.

Canadian worth-while industrial enterprise is in process of being vindicated; there is nothing mushroom either about its roots or in its growth. We look to see a keener and more widespread appreciation of the rugged and substantial make-up of its directors as not the least gratifying outcome of the Meredith-Duff Commission Investigation.

LEADERSHIP A FACTOR IN INDUSTRIAL ORGANIZATION

SIGNIFICANT events have happened in recent months in industrial circles which indicate a peculiar restlessness in practically all of the various strata of society connected with manufacturing pursuits. Apart from any military aspect, and because only of the degree of perfection to which she has carried the organization of her national resources,—men, materials and money, Germany and her methods have been the subject of much comment and have elicited not a little admiration. Meantime, and no doubt largely as a result of the foregoing, earnest efforts are being made by the Allies in similar directions, which indicate that they, too, are fully alive to the necessity of at least equivalent organization, even if for nothing else than a means of insuring that future peace which is essential to the happiness and prosperity of all sane nations.

One feature stands out prominently in all criticisms of the present state of affairs,—the value of leadership in training the German people and developing such resources and ability as they possessed, so that they became in time of peace a vast commercial machine, the efficiency of which is well evidenced by the position they so quickly attained in the realm of commerce the world over.

In the present struggle of democracy against autocracy, the forces of the former have gradually but none the less surely grasped the fact that however much their principles are opposed to the latter, and however strenuously these may be displayed and practiced, efficient leadership is an essential factor. The latter is true in the success of any operation, military, civil or commercial. Efficient leadership, as such, however, has not been a conspicuous factor in the industrial life of Britain or the United States. Outstanding examples of commercial or scientific genius there have been, no doubt, but close intimacy between originators and applicators has not existed to the degree necessary to insure either of these countries deriving the fullest benefit from the latent potentiality of their man capacity.

The fullest and most sincere co-operation of all workers will be absolutely necessary in the ultimate struggle for commercial supremacy of the awakened nations, and in no branch of industry will this be so imperative as in engineering. Engineering is the one thing, next to, yet on a par at least with men on the fighting line, which is deciding this struggle, and will continue even more so to be the chief factor in the maintenance of position in the near future, or when peace again reigns.

Leadership, however, implies a following, and without loyal support by the great body of workers, the efforts of various bodies and individuals to insure a continuance of industrial prosperity will be largely, if not completely nullified. Given equal degrees of leadership, the influence of national traits is bound to modify ultimate results in different countries. Receptivity in regard to processes, methods and material has been a potent factor in the industrial rise of the United States, just as conservatism has to some extent been a characteristic of British workmen. It is just possible, however, that the distinctions in these respects may be less apparent in the future. Arising out of the manufacture of war supplies and munitions, American employers have been beset with labor troubles more or less serious, due to demands for higher wages and otherwise. On the other hand, the efforts of British and Canadian workmen, similarly engaged, have been greatly influenced by the fact that the safety and success of their fellow-countrymen on the firing line were directly dependent on their individual and collective attitude and exertions.

Conditions during the past year have done more than anything else to show the value of co-operation between managements and men. New methods, new tools, new men all have been requisitioned, adapted and absorbed in the widening circles of manufacturing activity, and, in so doing, have repeatedly demonstrated the necessity and value of leadership in securing successful accomplishment. Leadership and co-operation will be still more a requirement, as industrial conditions tend towards normal, and evidences are everywhere abundant in our midst that the most exacting demands will be met.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh		$18 70
Lake Superior, charcoal, Chicago		19 75
Michigan Charcoal iron		28 00
Ferro nickel pig iron (Soo)		25 00
	Montreal.	Toronto.
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Victoria, No. 1	$27 00	$25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	3.00
Steel bars, f.o.b., Toronto	3.00
Steel bars, 2 in. and larger, base	5.25
Common bar iron, f.o.b., Montreal	3.00
Steel bars, f.o.b., Montreal	3.00
Twisted reinforcing bars	3.25
Bessemer rails, heavy, at mill	2.50
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents.**
Steel bars	3.00
Small shapes	3.25
F.O.B. Chicago Warehouse	**Cents.**
Steel bars	3.10
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points.

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal.	Toronto.
Lake copper, carload	$33 00	$32 00
Electrolytic copper	32 50	31 75
Castings, copper	31 00	31 50
Tin	50 00	54 00
Spelter	22 00	21 00
Lead	9 25	9 50
Antimony	45 00	47 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in.	$4 00	$4 00
Heads	4 25	4 25
Tank plates, 3-16 in.	4 30	4 50

WROUGHT IRON PIPE

Prices in effect April 26, 1916.

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 06	5 31
1/2 in.	3 91	6 08
3/4 in.	4 72	7 65
1 in.	6 97	11 31
1 1/4 in.	9 43	15 30
1 1/2 in.	11 28	18 29
2 in.	15 17	24 61
2 1/2 in.	23 99	38 90
3 in.	31 37	50 87
3 1/2 in.	37 72	61 18
4 in.	44 69	72 49
Lapweld		
2 in.	$17 02	$26 46
2 1/2 in.	25 16	40 07
3 in.	32 90	52 40
3 1/2 in.	39 56	63 02
4 in.	46 87	74 67
4 1/2 in.	57 15	90 81
5 in.	66 60	105 82
6 in.	86 40	137 28
7 in.	116 62	179 70
8 in. x 25 lbs. per ft.	122 50	188 75
8 in. x 25 lbs. per ft.	141 12	217 44
9 in.	169 05	260 48
10 in. x 32 lbs. per ft.	156 80	241 60
10 in. x 40 lbs. per ft.	201 88	311 06

List for Ontario, Quebec and Maritime Provinces.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 25	$18 25
Copper, crucible	21 75	21 50
Copper, heavy	22 00	22 00
Copper wire	22 00	22 00
No. 1 machine compos'n.	17 00	17 00
No. 1 compos'n turnings.	15 00	15 00
New brass clippings	16 25	15 00
No. 1 brass turnings	12 00	12 00
Heavy melting steel	9 00	10 00
Boiler plate	11 75	10 50
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	11 50	9 00
Stove plate	10 50	10 50
No. 1 machin'y cast iron	14 75	14 50
Heavy lead	7 00	7 25
Tea lead	6 25	6 25
Scrap zinc	15 00	14 00
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	50
Stove bolts	62 1/2
Plate washers	30
Machine bolts, 3/8 and less	40
Machine bolts, 7-16 and over	30
Blank bolts	30
Bolt ends	30
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in.	$3.75 per lb. off
Nuts hex., over 1 in.	$2.00 per lb. off
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	37 1/2
Boiler rivets, base, 3/4-in. and larger	$4.60
Structural rivets, as above	4.50
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS

	Per cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	50
Finished Nuts over 1 in.	37 1/2
Semi-Fin. Nuts up to 1 in.	50
Semi-Fin. Nuts over 1 in.	37 1/2
Studs	45
Taper pins	.65
Coupling bolts	net
Planer head bolts, without fillet	.15
Planer head bolts, with fillet	net
Planer head bolt nuts up to 1 in.	.60
Planer head bolt nuts, over 1 in.	.55
Planer bolt washers	list plus 10
Hollow set screws	list plus .20
Collar screws	list plus .20
Thumb screws	.20
Thumb nuts	.75

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh.	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES.

Standard steel wire nails, base	3 70	3 65
Cut nails	3 40	3 40
Miscellaneous wire nails	65%	
Pressed spikes, 5/8 diam., 100 lbs.	$3 75	

MISCELLANEOUS

Solder, guaranteed	0.31
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.18
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls., gal.	0.72
Linseed oil, raw, single bbls.	0.93
Linseed oil, boiled, sinble bbls.	0.96
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Packing, square headed	0.25
Packing, No. 1 Italian	0.30
Packing, No. 2, Italian	0.23
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per cent.
Standard drills to 1½ in.	50
Standard drills over 1½ in.	15
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	10
Bit stock	50
Ratchet drills	15
Machine bits for wood	10
S.S. drills for wood	20
Wood boring brace drills	35 and 5
Electricians	20
Sockets	50
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks	list plus 5
Bridge reamers	55
Centre reamers	5
Chucking reamers	5
Hand reamers	5

High speed drills and reamer prices withdrawn.

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, 5 per cent.; B and C, 25 per cent.; cast iron, 50 and 10; standard bushings, 60 per cent; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$4 15	$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 25
Canada Plates, all bright	6 30	6 00
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	7 00	7 00
Premier, 10¾ oz.	7 25	7 25

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.55
⅜ in.	6.90
7-16 in.	6.75
½ in.	6 55
9-16 in.	6.55
⅝ in.	6.35
¾ in.	6.15
⅞ in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B.B

⅛ in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16 in.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	65-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES

Size	Seamless	Lapwelded
1 in.	$19 55	....
1¼ in.	19 55	....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	12 75
2¼ in.	26 60	15 45
2½ in.	29 00	17 20
3 in.	38 70	19 50
3½ in.	44 00	24 00
4 in.	49 50	30 60

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands.

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble,	40 & 10%
Standard	50%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto.

WASTE

WHITE.	Cents per lb.
XXX Extra	.16
Peerless	.16
Grand	.15
Superior	.15
X L C R	.14
Atlas	.14
X Empire	.13
Ideal	.13
X press	.12

COLORED.

Lion	.10¼
Standard	.9¼
No. 1	.9¼
Popular	.8¼
Keen	.7¼

WOOL PACKING.

Arrow ....
Axle .... Prices on
Anvil .... application
Anchor....................

WASHED WIPERS.

Select White ....
Mixed colored ....Prices on
Dark Colored .... application

This list subject to trade discount for quantity.

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	37 to .39
Tin	.58 to .60
Zinc	26 to .28

Prices Per Lb.

COPPER SHEETS

	Montreal	Toronto
Bars. ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 m.	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

BRASS

Brass rods, base ½ in. to 1 in. rd.	0.55
Brass sheets, 8 in wide 20 oz.	0.60
Brass tubing, seamless	0.55
Copper tubing, seamless	0.55

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

RUBBER BELTING

Standard	50%
Best grades	30%

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy	.35
Copper sulphate	.24
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Monteal, Que., May 8, 1916.—General conditions throughout the industrial field remain unchanged. The apparent scarcity of labor, coupled with disputes over working conditions and wages, have resulted in a practical tie-up at certain points. A strike of carters in Montreal has caused the various railroads to place a temporary embargo on certain freight destined to that point. This, to some extent, is affecting the shipping at the harbor, as the opening of navigation places Montreal in a prominent position regarding marine transportation. Export trade is still seriously handicapped by the evident scarcity of ocean vessels, and under existing conditions little relief is expected, as the possibilities for additional tonnage seem very remote.

Pig Iron

The situation is practically unchanged. Owing to the apparent scarcity of furnace coke, and the abnormal demand, quotations are higher this week by 25c per ton on prompt, and 10c on futures; current prices being $2.25 and $2.50 for future.

Steel

Continued activity prevails throughout all branches of the steel and metal working industries, and plants are still working to capacity in an effort to meet requirements. The demand at present is light, and new orders have fallen off, which might indicate that buyers are holding back in the hope that prices may become easier. While the general run of material is holding firm at prices recently quoted, some lines have shown advances. Forging billets, Pittsburg, are up 50c, being quoted at $69 per ton. The demand for billets is still heavy, and producers of sheets are working at capacity and well supplied with bar stock. The Carnegie Steel Company are now quoting 1.475c per pound for heavy rails. This is in effect from May 1, and is an advance of about $4.50 per ton. Pittsburg price on iron bars is now 2.60c, being an advance of $2 a ton. Wire nails show a similar advance, present price being $2.50: fence wire and galvanized barb wire with advances of $4 and $2 respectively are now quoted at $2.45 and $2.35. The requirements of sheet consumers are very heavy, and in the case of automobile manufacture, the demand this year is greater than ever before. Effective May 1, an advance of $6 a ton is noted on wrought iron pipe up to 6 inches and an advance of $4 on the larger sizes. If the present heavy demand continues, further advances may be expected. Premiums are being offered for two or three months' delivery on boiler tubes, as nearly all the mills are booked ahead to the close of the year.

Metals

The general market conditions in all metals are very quiet. Foreign demand for copper may follow recent inquiry, and increased activity is looked for. Uncertainty of supply and delivery is creating a very unsteady tin situation, and prices are subject to change. Spelter has shown signs of weakness during the past week or so, owing to the situation prevailing in U. S. Government circles. The market in lead is becoming easier, as many of the large consumers are well covered, and the general demand is light.

Copper.—The present market is comparatively quiet, with possibilities of future activity, due to extensive inquiries from foreign sources for this year's delivery. With both market and production in their present state, the chief difficulty with a heavy additional demand will be the supply of metal. Unless the future demand is of an extraordinary nature, it is generally expected that the situation can be taken care of, but slightly higher prices may be expected. London copper is very strong on advancing prices; electrolytic being quoted at £150; standard firm at £137, and £130 for spot and futures respectively. New York quotations are also slightly higher; 30c being asked for lake, 31c for electro, and 28c for castings. Local dealers report a strong and active market, with prices firm and unchanged.

Tin.—Difficulty is being experienced by dealers in securing metal, owing to the delay in securing shipping permits from London. The situation is becoming quite serious, and some importers are un-

able to make delivery on placed orders, being forced to buy available metal to satisfy customers. A fair volume of business was reported for the week, with prices fluctuating under an irregular market. Heavy demand at the early part of the week resulted in a sharp advance, but the easing off during the later half caused a decline of 2c on the New York market, the present quotation being firm at 50½c. Quotations are relatively firm. London reports slight increases on standard and straits spot, quotations being £201 for each. Local conditions are unchanged, with prices firm at 50c per pound.

Spelter.—The market is very quiet and prices are weakening. Recently published reports on the spelter situation, showing the prospective increase in production, have had much to do with the present state of the market. Slight activity is noted in recent inquiries from galvanizers, for second quarter metal, but the general tone is one of comparative dullness. Present London prices are £98 for spot and £92 for futures. New York shows a decline of ¾c on the week, present quotation being 17½c nominal. Local dealers report a quiet market, with prices weakening, present price of 22c showing a decline of 1c over last week.

Lead.—Prices are holding comparatively firm, as little evidence is noted of heavy selling. Trust and outside prices are almost on a par, at 7½c New York, with some outside interests quoting ⅛c lower. In response to a dull market, local dealers have lowered prices, this week's quotation of 9¾c showing a decline of ¼c per pound.

Antimony.—Little interest is shown in antimony at present. The market is quiet; quotations hold firm, and very little change is anticipated in view of the fact that the current output is well absorbed. Conditions here are unchanged, with prices firm at 45c.

Aluminum. — Unchanged conditions prevail and prices are firm at 68c per pound.

Machine Tools and Supplies

The general machinery situation is becoming easier each week, as the requirements of machines for munition purposes are almost taken care of, and the delivery of long-placed orders are more reliable. Tool builders are, however, kept busy on the heavier types of machines, and those for domestic requirements, which, under existing conditions, are very encouraging. If strikes in the States are extended it may affect the present machine tool situation as well as other lines of metal industries. Recent advances to employees in many industrial plants, coupled with the high cost of raw and semi-finished material, are resulting in increased prices on many lines of machine shop supplies. The demand is still as great as ever, and in some instances full delivery of requirements is impossible.

Old Materials

Consumption of old materials at present is very great, but many of the large users are well supplied for immediate and early future requirements. Belief is prevalent that prices will become easier. Wrought iron scrap is in good demand. Local dealers report fair business, with prices firm and unchanged.

Toronto, Ont., May 9, 1916. — Business conditions continue to show steady improvement and the favorable outlook is helping to maintain a spirit of confidence throughout the country. Orders or war equipment and supplies are keeping the factories busy, many working at full capacity. The shortage of much raw material is becoming more serious and is causing considerable concern to manufacturers while the difficulty that is being experienced in securing sufficient help is also tending to restrict production. The freight situation while not quite so acute is still causing considerable inconvenience to merchants especially as regards goods consigned to Eastern points. Shipments from United States are also being delayed owing to congestion in the railway yards. The customs returns for the port of Toronto for April indicate a marked revival in trade. The revenue for April was $2,767,301, being a gain of $1,264,000 over the corresponding month of last year. The receipts constitute a record for the port.

Steel Market

While prices of steel products are not advancing quite so rapidly as they have been doing, the market is just as strong and the mills are booking orders well into the first quarter of 1917. Deliveries are getting more backward as the steel companies cannot take care of all the business offering. The Algoma Steel Corporation have booked an order for 15,000 tons of rails from the Pere Marquette Railway. Prices are being well maintained, there having been few important changes made during the week. Smooth steel wire No. 0-9 gauge has advanced 15c and is now quoted at $3.90 per 100 lbs., base. Cold rolled shafting is very firm at last week's advance. The demand for shafting continues heavy and prices have a higher tendency. Prices of boiler plates are unchanged but the market is very firm. Some makers of boiler tubes state that they are practically sold out for the remainder of the year, while on seamless tubes they are sold up for the first quarter of 1917. Prices are very firm and are likely to be higher in the near future.

The galvanized sheet situation is unchanged, the market being firm and prices well maintained. The spelter situation shows no improvement and galvanizing plants are still operating at considerably reduced capacity. The demand for black and blue annealed sheets continues heavy and shipments are becoming more backward than ever. The market is firm and prices unchanged.

The steel market in the United States continues very firm and prices are still advancing. The mills claim that they are trying to hold prices in check but without success, and that consumers are putting the market up by bidding high prices for material which the mills cannot furnish for six to eight months. Steel bars are unchanged at 3c, and iron bars are higher at 2.60c, Pittsburgh. Plates and shapes are unchanged at 3.75c, and 2.60c, Pittsburgh. Forging billets have advanced again and are now quoted at $69 per ton Pittsburgh. The ferro-manganese market is a little easier but very high prices are still being paid for prompt delivery ferro.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attaché, Room 904 Flat Iron Building, New York City.

Scrap Material

Conditions in the markets are practically unchanged and prices have been maintained at last week's level. The general tendency for prices continues upward and the market is very firm at unchanged prices. The only exception of any importance is zinc which has declined and is now being quoted at 14c per lb. Although the pig lead market is weaker, prices of scrap lead are unchanged. All copper and brass prices are very firm with demand fairly active. Heavy melting steel is unchanged but firm on good demand.

Machine Tools

There is little change to note in the situation. Business is quieter but there is a steady demand for tools principally in single units for shell plants and equipment for tool rooms.

Supplies

Prices generally for machine shop supplies continue to advance although some lines have declined. A new bolt discount has been issued, making an advance of about 15 per cent. The new discounts are as follows: coach and lag screws, 50 per cent.; machine bolts 3/8 in., and less 40 per cent.; machine bolts 7-16 in., and over 30 per cent.; blank bolts and bolt ends 30 per cent., and stove bolts 62½ per cent. The linseed oil market is weaker and prices have again dropped, the new quotations being 93c for raw, and 96c for boiled oil, per gallon. Turpentine has also declined and is now quoted at 72c per Imperial gallon. Manila rope has advanced 1½c. and is now quoted at 22½c per lb.. base.

Metal Markets

With the exception of copper there is a decidedly easier tone to the markets, and lower prices have been registered for tin, spelter and lead. Lead is particularly dull, the outside market being now lower than the "Trust" price. The copper market although quiet is strong on account of the exceptionally heavy demand. Tin is firm in London but weaker in New York, the difficulty in getting licenses still dominating the market. The spelter market is apparently being affected by the strained relations between the United States and Germany. Antimony and aluminum are quiet and unchanged. Solders have declined slightly following the weakness in the tin and lead markets.

Copper.—Although the market is quiet, copper prices are tending still higher as a result of a persistent and widespread demand which is fast cleaning up all available supplies, other than for delivery in the last three months of the year. It is reported that the British and French Governments are in the market for another large amount of copper for delivery during the first quarter of 1917. The local market is strong and quotations nominal at 32c per pound.

Tin.—The market is weaker and lower for spot tin but firm for futures. The market in New York is being affected by the difficulty still being experienced in obtaining licenses to ship tin from England. Local quotations have declined 2c and are nominal at 54c per pound.

Spelter.—The primary market is dull and easy being depressed by the strained relations between the United States and Germany. Dealers are doing nothing and are apparently waiting developments. Spelter has declined 1c locally and is now quoted at 21c per pound.

Lead.—The market is very dull and little business offering. The outside market is now lower than the "Trust" price of 7.50c New York, the latter being unchanged. The demand is light and situation featureless. Lead has declined ½c and is now quoted locally at 9½c per pound.

Antimony.—The situation in the antimony market has a tendency to depress prices but meanwhile quotations are unchanged and nominal at 47c per pound.

Aluminum.—The market is dull and featureless with quotations unchanged at 68c per pound.

Solders. — Prices are slightly lower due to the decline in lead and tin. Guaranteed is now quoted at 31c, and strictly at 29c per pound.

LOGGING MACHINERY FOR BURMAH

In a communication to the Departmest of Trade and Commerce, H. R. MacMillan, Special Trade Commissioner, states that an opening exists in Burmah for Canadian machinery used in logging operations. Authority has just been granted by the Government for the purchase of one logging engine, to haul logs up to a maximum of 3 tons weight, a distance of 3,000 feet over smooth ground, and although previous machines have been of American construction, a Canadian machine would now be preferred. If this order were satisfactorily executed, it is stated that further business could undoubtedly be secured as forest development is only in its initial stages in Burmah. Canadian manufacturers should communicate immediately with the Conservator of Forests (whose name and address will be supplied on application to the Department. Refer File No. A-2017) and forward catalogues, price lists, and complete description of types of engines.

CHEMICAL PRICES SHOW BIG ADVANCE

ADVICES from New York state that prices of chemicals used in the manufacture of war materials have receded somewhat from the high levels recorded in the later months of 1915. This has been due partly to increased production and to the fact that most of the large buyers placed their contracts ahead last year, both these tending to lessen the pressure of demand.

The decline has been comparatively small on the whole, one or two chemicals having been affected but little, while the whole list of the products in question are now at levels considerably above the normal and the tone of the market is healthy. In some instances quoted prices are more or less nominal, as trade authorities say a buyer wanting a large quantity would hardly be able to get it at the present quotations because of the sold-up condition of sellers.

Below is a list of the principal chemicals used in making explosives, with the market price as of July 1, 1914, the high price reached in 1915 and the existing market level:

	1914 July 1	1915 High	1916 May 3
Sulphuric acid (lb.)	1c	3¾c	2½ to 3c
Benzol (gallon)	$0.25	$1.25	$0.80
Toluol (gallon)	1.00	5.00	4.35
Carbolic acid (lb.)	.07	1.75	.90
Picric acid (lb.)	.40	1.75	1.60
Nitric acid (lb.)	.04	.07	.07
Smokeless powder (lb.)	.50	$1-1.25	.75

GOVERNMENT AIDS RAILWAYS

THE Dominion Government's aid to the Canadian Northern Railway and Grand Trunk Pacific Railway appears in the supplementary estimates presented to the House on May 2. There is provided a loan of $15,000,000 to the C.N.R., and $8,000,000 to the G. T. P. An item of $150,000 is also provided for inquiry and report upon the railway situation of Canada, and another of $10,000 for an audit of the revenues and the expenditures of the G. T. P. and C. N. R.

The loan to the C. N. R. is chargeable to income and is at six per cent., payable half yearly, and is to be used for expenditure made or to meet indebtedness incurred in paying interest upon securities of other companies in the C. N. R. system and upon construction. It is to be secured by mortgage, and so much of said loan as may be applied for the benefit of any company included in the C. N. R. system is to be secured in addition by mortgage on the undertaking of such company.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Renfrew, Ont.—The Renfrew Machinery Co., will rebuild their plant which was recently destroyed by fire.

Toronto, Ont.—The Imperial Oil Co., propose purchasing a site covering 11 acres for the purpose of erecting an oil refining plant near Ashbridge's Bay.

Vancouver, B.C.—Thomas Shaw, Victoria, B.C., will establish a boiler shop in Vancouver, B.C., and is in the market for a 15 h.p. motor, air compressor, etc.

Quebec, Que.—Part of the General Car & Machinery Co. plant at Montmagny, near here, was destroyed by fire on May 7. Charles A. Paquet is general manager.

Renfrew, Ont.—The dry house of the O'Brien Munitions was completely destroyed by fire on May 5. The damage is estimated at $40,000, and is covered by insurance.

Montreal, Que.—William Hood & Son, 10 Richmond Square, are in the market for a trimming press or punch for drop forgings; also a power hammer, belt or steam-driven.

Brantford, Ont.—William P. Kellet, former general manager of the Lake Erie & Northern Railway, who has been running a munition factory in the Ker & Goodwin plant here, has sold out his interest to Ker & Goodwin, and has gone to Toronto.

London, Ont.—The School Board will install a boiler at the new technical school and will be in the market for iron and wood-working machinery, electrical equipment, etc.

Montrose, Ont.—The Michigan Central Railway Co. has let the contract for the construction of a roundhouse, coal dock and other buildings at Montrose, Ont., to Wallbridge & Aldinger, Detroit, Mich. The buildings will be of brick and concrete and will cost $250,000.

St. John, N.B.—The T. McAvity & Sons, recently received an order for munitions and will build an iron and brass foundry on Marsh Road adjacent to the Intercolonial Railway tracks. It will be one of the largest in the lower provinces. The company will spend $100,000 on the plant the first year and is in the market for the following machinery: Lathes for making 8-in. shells, from 16 to 18 in. single-purpose, and from 24 to 35 in. standard lathes for roughing, finishing and boring, etc.; 36 to 40 drilling machines, banding presses, wave ribbing, tapping, recessing and copper band turning, thread milling machines with complete equipment; also an entire tool-room equipment; machinery for power plant, including a 250 x 500 k.w. generator unit, either direct or alternating current; a compound condensing engine, high-speed preferred; eight 25 or 30 k.w. motors, etc.

Electrical

Ingersoll, Ont.—The town council contemplate the installation of an ornamental lighting system.

Toronto, Ont.—The Toronto Hydro Electric Commissioners propose building an addition to the transformer station at Front and Cherry streets. Approximate cost $6,000.

Niagara-on-the-Lake, Ont.—The town council propose installing motor-driven pumps in connection with the water works system.

Cobalt, Ont.—The Northern Ontario Light & Power Co., has signed the franchise recently drawn up, and will proceed at once with changing the lighting system on the streets.

Toronto, Ont.—The Toronto Hydro-Electric Commission have decided to extend the West Toronto sub-station at Edwin and Ruskin avenues. The contract for this has been awarded to A. J. Penberthy. A new sub-station is to be erected at 101 and 103 Jefferson avenue, the land purchased to cost $5,950.

ELECTRICAL EQUIPMENT FOR NEW ZEALAND

The Department of Trade and Commerce has been informed by W. A. Beddoe, Trade Commissioner, Auckland, that the Oamaru Borough Council invites tenders up to June 23 for the following contracts:—Overhead mains; power station equipment (Pelton wheels, alternators, etc.); service metres and transformers. Plans and specifications have been sent to the Department, where they may be secured on application. (Refer File No. A-1939.)

Municipal

Wyoming, Ont.—The Hydro by-law was unanimously carried here recently.

Rodney, Ont.—The Hydro by-law was carried here on May 1 by a majority of twenty-six.

Arthur, Ont.—The Hydro-Electric by-law, voted on here last Monday, was carried by a vote of 211 to 6.

Clinton, Ont.—The Town Council contemplates an expenditure of $15,000 for extending the water works system.

Cartierville, Que.—The sum of $23,000 has been voted by the Town Council to complete the Imhoff tank for the purification of sewage. The original estimate of cost was $10,000.

Port Hope, Ont.—The by-law to grant exemption to a new manufacturing industry was carried by a large majority on Monday. There were 356 votes cast, and only five were recorded against the by-law. S. E. Brandon, of Toronto, is head of the new concern, but is not decided yet what line of goods the company will manufacture.

Toronto, Ont.—At a meeting of the city council recently by-laws were passed authorizing the issue of debentures to raise approximately $3,500,000 to cover the cost of local improvement works carried out in 1914-15. In addition, other money to provide for the issue of instalment bonds for work already authorized and completed; also to provide $1,248,000 for extension of the Civic Hydro System.

General Industrial

Sandwich, Ont.—The Canadian Salt Co., are building an extension to their plant here.

Toronto, Ont.—The Campbell Flour Mills Co., will build a cooperage plant to cost $5,000.

Winnipeg, Man.—The Dominion Government propose erecting a terminal elevator here at a cost of $500,000.

Peterborough, Ont.—The Quaker Oats Co., will build an extension to their factory here at a cost of about $50,000.

Toronto, Ont.—Fire recently caused $7,500 damage to the plant of Wilson & Warden, 58 Duchess street, manufacturers of bottlers' supplies, etc.

Montreal, Que.—The St. Lawrence Paper Co., of this city will build a paper mill at Cap Madeleine, Que.

St. John, N.B.—It is proposed to rebuild the government elevator here which was burnt down about two years ago. The cost is estimated at $500,000.

Toronto, Ont.—Work has started on the erection of a factory for the Flint Varnish & Color Co. Estimated cost, $150,000.

Simcoe, Ont.—The Unique Shoe Co. propose to build a factory at an approximate cost of $10,000. A by-law will be submitted to the ratepayers.

Harrow, Ont.—The W. Clark Co., Montreal, propose building a cannery here. R. Findlay Montreal, is the architect, and the approximate cost is $15,000.

Winnipeg, Man.—The Stovel Co., printing and engraving plant was destroyed by fire on May 2. The loss is estimated at $400,000, with insurance of $266,000.

Chatham, Ont.—Machinery is being installed at the Chatham Shoe Co. plant, and it is expected that manufacturing will begin shortly. E. S. Hunt is president of the company.

Berlin, Ont.—The large frame building, known as the Old Skating Rink, was totally destroyed by fire on May 6. The building was occupied by the Schreiter Bedding & Mattress Co. and Walters & Sons, manufacturers of fibre products, both of whom suffered a total loss on their stock. The loss is estimated at about $15,000.

Tenders

Burlington, Ont.—Tenders will be received up to May 13, 1916, for a two-ton combination chemical engine hose truck. Specifications on application. Jas. S. Allen, clerk.

Charlottetown, P.E.I.—Tenders will be received by the engineers, R. S. & W. S. Lea, Montreal, until May 20, for the erection of a pumping station and installation of a one-million-gallon pump at Charlottetown.

Haileybury, Ont.—Tenders will be received up to May 15, 1916, for the furnishing material and erection of Haileybury School of Mines Building. Plans and specifications may be seen at the secretary's office, T. & N. O. Ry. Station.

North Bay, Ont.—Tenders will be received up to May 15, 1916, for the supply and delivery of approximately 3,100 feet of 6-inch and 630 feet of 4-inch cast iron pipe and specials. Specifications may be obtained from H. J. McAuslan, town engineer.

London, Ont.—Tenders will be received until May 12, 1916, for the construction of the East End Sewage Disposal Works. Specifications, forms of tender, plans, etc., may be seen at the City Hall, London, or at the office of the engineers, Chipman & Power, 204 Mail Bldg., Toronto.

Hamilton, Ont.—Tenders addressed to the Chairman Board of Control, will be received up to May 16 for the supply and installation of a gasoline tank pump and oil cabinet for City Garage, Hughson Street. Specifications may be obtained from S. H. Kent, city clerk, at the City Hall.

SAW-MILL MACHINERY REQUIRED IN RUSSIA

Makers of saw-mill machinery will learn with interest that Russia now occupies first place among the nations of the world in the extent of its timber resources. The total area of the Empire is about one-seventh of the land surface of the globe, and 39 per cent. if it is under forests.. Those in European Russia cover an area of 474,000,000 acres; in Finland, 50,500,000 acres; in Poland, 6,700,000 acres; and in Caucasus 18,600,000 acres; a total of 549,800,000 acres, exclusive of Siberia. The Russian Forestry Department places the total timber land in Siberia at 810,000,000 acres, of which two-thirds can be successfully placed on the market.

Ottawa, Ont.—Tenders addressed to the chairman of the Board of Control will be received up to May 16, 1916, for the superstructure for Pretoria avenue bridge. Plans, specifications and full particulars may be obtained on application to the city engineer's office on a deposit of $50. F. C. Askwith, acting city engineer.

Prince George, B.C.—Tenders for (a) wire bound wood pipe; (b) lap-welded steel pipe; (c) specials or castings; (d) valves, and (e) hydrants, will be received up to May 10, 1916. Plans and specifications may be obtained at the office of J. A. Turner, city clerk, Prince George, or the consulting engineers, DuCane, Dutcher & Co., Vancouver, B.C.

Toronto, Ont.—Tenders will be received addressed to the chairman, Board of Control, City Hall, up to May 23, 1916, for the complete construction of a steel frame, brick-faced tile addition, including heating plant, to the St. Clair avenue car barn, Christie street. Specifications and forms of tender may be obtained upon application at Room No. 311, Department of Works, City Hall.

Ottawa, Ont.—Tenders for submarine cable will be received until May 15, 1916, for 10 knots of single conductor submarine telegraph cable (107 lbs, copper and 150 lbs. gutta percha per knot), with sheathing of 12 No. S.S.W.G. iron wires, to be delivered at Halifax, N.S. Specification and forms of tender can be obtained on application to the office of the general superintendent of the Government Telegraph Service at the Department of Public Works, Ottawa.

Toronto, Ont.—Tenders will be received by the Chairman Board of Control, City Hall, up to May 23, 1916, for the supply and delivery of: One single truck, double end, street car, completely equipped; one car body, double end, single truck; equipment for one single truck car, electrical equipment; equipment for one single truck car. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Trade Gossip

The Manitoba Rolling Mills new plant at Selkirk, Man., commenced operations last week.

Ottawa, Ont.—The estimates of the Public Works Department include an appropriation of $600,000 for improvements to Toronto harbor.

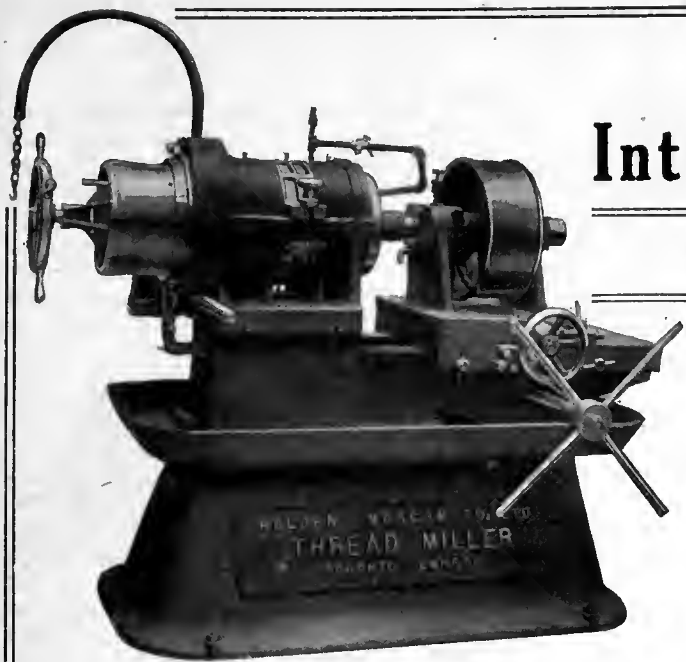
Toronto, Ont.—The Ontario Government has passed an Order in Council transferring the control and operation of the Trent Valley power undertaking to the Provincial Hydro-Electric Commission.

The Hudson Motor Car Co., whose incorporation is in Michigan, has been given permission to carry on its business of manufacturing and dealing in automobiles to the extent of $40,000 a year, in the Province of Ontario.

Ottawa, Ont.—Sir Thomas White's bill providing for the payment of a bounty on zinc produced in Canada has passed, and also a subsidy for the Quebec and St. John Valley Railway. The bill provides for Government operation of the road.

Toronto, Ont.—It has been decided to recommend to the Board of Control that a public and industrial bureau be formed, consisting of representatives of the several organizations, such as the Board of Trade, Manufacturers' Association and kindred bodies.

Cobalt, Ont.—The Dominion Rand Co., which is operating a copper mine near the T. & N. O. at Temagami, shipped another car of ore last week, which weigh-



The Holden-Morgan
Internal Thread Millers

Representing 7 in., 8 in. and 9 in. sizes.

The machine illustrated above has for its principle simplicity and perfection, and was designed especially for milling the internal threads on the nose or base of the shell body.

The shell is carried between two conical surfaces in the interior of the mandrel, this ensures the thread being milled perfectly true with the axis of the shell, and holds the shell in a much firmer and truer position than is possible with collet chucks. The master screw is chased on the outside of the mandrel, which entirely precludes the possibility of "drunken threads."

The milling head is carried in movable carriage and both slides are moved up to positive stops and locked so that thread is milled absolutely the same size in every instance.

Each machine is complete with oil-pump and pan.

NOTE—Countershaft is provided with machines over 6 in. size only, as smaller sizes are run direct from line shaft.

	7 in.	8 in.	9 in.
Net weight			3300 lbs.
Weight Crated	Approximately same as 9 in. size		3400 "
Weight Boxed			3500 "
Shipping Dimensions			108c. ft.
Time per Operation Threading or Recessing Base	12 mins.	14 mins.	16 mins.
Threading Nose	6 "	8 "	10 "

Code Word			
Base..	Aeves	Ahgle	Anin
Nose..	Seves	Eigha	Nina

The A. R. Williams Machinery Co., Limited

64-66 Front St. West - - - - Toronto

Don't Depend on Somebody Else

For Your Small Threaded Parts

THREAD THEM YOURSELF

A GEOMETRIC THREADING MACHINE SOON PAYS FOR ITSELF

Takes floor space 2 ft. x 3 ft. and is complete with countershaft, change speed gear, adjustable stop for gauging length of thread.

No rough threads with the Geometric. They are as true and clean as can be produced on any Screw Machine.

From 1/8-inch pipe thread to 1-inch diameter is the usual range of the machine, but where fine pitch threads are to be cut on larger diameters, it can be fitted with a Die Head that will take care of the work.

Submit Your Threading Proposition to Us.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U.S.A.

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, and St. John, N.B.

ed 68,920 pounds recently, and as soon as the breakup is over the company expect to ship one or two cars daily.

Toronto, Ont.—The Provincial Hydro-Electric Commission is to enter into a general agreement with York township for the supply of electric energy to be delivered by the Toronto Hydro system, which is now supplying certain sections of the township with light and power.

A Canadian Research Bureau has been established by the C. P. R. Its purpose is to investigate and study the natural resources of the country in a scientific manner. Research laboratories will be established at different points in the Dominion. Arthur D. Little will have charge of the bureau.

Hudson Bay Railway.—Estimates of the Department of Railways include appropriations of $3,000,000 to carry on the construction of the Hudson Bay Railway and its terminals at Port Nelson, and $1,500,000 for work on the National Transcontinental Railway. Hon. J. D. Reid estimates that the project will cost in all $26,000,000, and will be completed in the autumn of 1917.

The Collingwood Shipbuilding Company successfully launched on April 29, the second of the oil tank steamers which they are building for the Imperial Oil Co. The christening ceremony was performed by Miss Frances Mayer, daughter of the vice-president of the latter. The Imperial Oil Co. has awarded the Collingwood Shipbuilding Co. three contracts for vessels of this class, and also an order for two larger ocean-going steamers, making five vessels in all.

Medicine Hat, Alta.—A deal was recently completed whereby the Western Canadian Steel Co. takes over the Redcliffe Rolling Mills plant. The purchaser is the Giant Corporation, which is about to erect a smelter just west of Medicine Hat. Individual members control the Western Canada Foundry Supply Co., which recently merged a large number of western industries. One of the men interested in this concern is Mr. McLaws, barrister, of Lougheed, Bennett & McLaws, Calgary.

Victoria, B.C. — The Government measure for assistance to shipping will be introduced shortly in the House. The bill contemplates, it is reported, the formation of a commission which will be given power to float bonds to the amount of two million dollars and from the proceeds to lend sums on ships to be built in the province for ocean-going trade up to 55 per cent. of their value. Restrictions will be placed, it is said, so as to provide that the boats must do business in and out of British Columbia ports. When the aggregate of two millions has been reached further legislative sanction will be required before any more money can be loaned.

Newfoundland Seal Catch.—The sealing season which closed on April 30 was one of the most successful in years, according to reports received at Curling, Nfld. Notwithstanding the loss from the fleet of all but one of the steel steamers through purchase or impression for Admiralty service, the catch reached a total of 225,000 pelts. The total value is estimated at $750,000. Nine of the twelve steamers which took part in the hunt have returned to port, and the others are expected to arrive within a day or two.

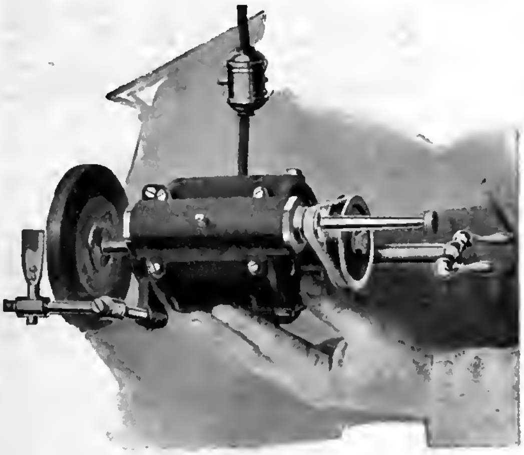
Railway Investigation.—The commission which is to be appointed by the Government to investigate and report upon the railway situation of Canada with a view to the nationalization of two at least of the present transcontinental lines will be announced shortly, and the investigation will begin in the near future. It is understood that one of the commissioners to be named will be a gentleman occupying a very prominent position in the railway world of the United States, another being a British or Canadian railway expert of equal eminence. These two commissioners, it is expected, will be given authority to select a third member.

New Ferromanganese Process.—It is reported from Pittsburgh, Pa., that a process for extracting ferro alloys of manganese and silica from slag, which it is claimed will result in an immense saving to steel manufacturers, has been discovered by George A. Hays, of Sewickley, Pa., and George D. Lain, of Elmira, N.Y., students at the Carnegie Institute of Technology. Ferro manganese and silica are essential elements in the manufacture of steel, but since the start of the European war both have greatly advanced in price, the former from $75 to $400 a ton. As a result of the process, slag which has always been practically a waste product will now become of commercial value.

The Turbine Equipment Co., Toronto, Ont., have sold to the Nova Scotia Steel & Coal Co. a 1,000 h.p. De Laval marine type steam turbine, complete with double helical reduction gears, for installing in a new boat which is being built by the Steel Company. The company will also supply the condensing equipment, bilge and boiler feed pumps.

Victoria, B.C.—The establishment at Ocean Falls, B.C., by the Fleishacker & Johnson interests of California of a $2,500,000 paper mill as an addition to the pulp mill already operating there is announced by Louis Bloch, of San Francisco, Cal., vice-president and general manager of the Crown Willamette Paper Co. The company Mr. Bloch represents

Aikenhead's DUMORE GRINDER



The DUMORE Portable Grinder. The only small grinder giving wheels the correct surface speed. Speed, 30,000 R. P. M.

IF you put a DUMORE Portable Grinder to work in your shop, you will quickly see a notable shrinkage in your grinding costs.

WHY?

It is portable—weighs but 17 pounds—easily carried from one job to another.

The DUMORE will do more and better work than the ordinary grinder. It saves time — and time means money.

A rapid, practical way of grinding special milling cutters.

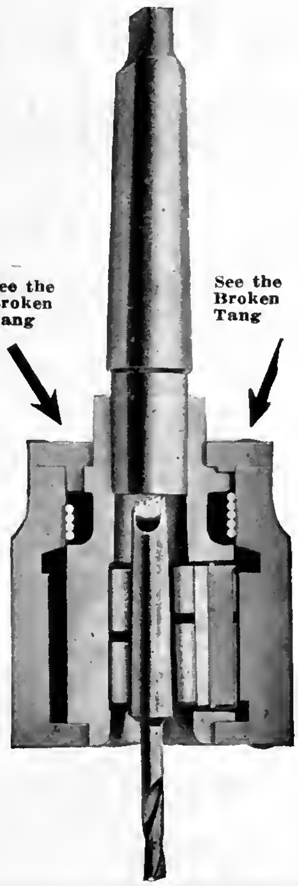
Aikenhead Hardware Limited

17, 19, 21 Temperance Street

TORONTO - - - CANADA

See the Broken Tang

See the Broken Tang



Don't Throw Away Broken Tang Drills

Perhaps you are about to discard some taper shank drills because the tangs are broken off —DON'T DO IT—they are worth their weight in gold. You can use them just as they are with a

Wahlstrom Automatic Chuck

One chuck holds drills from 1/16" to 1¼"

and you won't have to take time from your production to repair them.

Tool changes are made in two seconds—just grasp the shell of the chuck with one hand and put in or remove the tool with the other—no collets—no lost time, for the spindle never stops.

The jaws grip NOT BY THE TANG, BUT ON THE SIDE OF THE TAPER—there's no chance for slippage—a Wahlstrom won't even mar the shanks.

CANADIAN DEALERS:

Aikenhead Hdw. Co., Toronto, Ont., Canada
Williams & Wilson, Ltd., Montreal, Quebec, Canada

Wahlstrom Tool Company

350 Carroll Street Brooklyn, N.Y.

is one of a number operated by the California interests. The property on which the pulp mill is situated and which will be the site of the new paper mill, consists of more than 60,000 acres of timber, most of which is excellently adapted for pulp paper purposes and a sawmill capable of cutting 400,000 feet of lumber a day. Archie Martin is general manager of the Ocean Falls plant.

Personal

H. D. Cameron has been appointed mechanical engineer of the C. N. R., with office at Toronto, Ont.

Albert C. Smith, president of the Smith Foundry Co., Fredericton, N.B., died recently.

C. E. Raup, manager of S. J. Shimer & Sons, Galt, Ont., has resigned and has left Galt, to assume an important position with the company at their headquarters, Milton, Pa. S. J. Shimer & Sons recently disposed of their Canadian branch at Galt to a local syndicate.

Allan Purvis, superintendent of the C. P. R. at London, Ont., has been appointed general superintendent of the Eastern Division in place of A. E. Stevens, who has been transferred to a similar position at Moose Jaw, replacing J. G. Taylor, who had to relinquish his duties on account of ill-health.

W. Grant Fraser, of New Glasgow, N.S., has been appointed under the Imperial Munitions Board, as chief inspector of all munition factories in the Maritime Provinces. Mr. Fraser has had a long experience in steel manufacture, having been one of the smelter foremen for the Nova Scotia Steel & Coal Co., both at New Glasgow and at Sydney Mines.

Building Notes

Ottawa, Ont.—The estimates include an appropriation of $1,500,000 for the restoration of the Parliament Buildings here.

Toronto, Ont.—The city architect has issued a building permit to the Separate School Board for additions to the St. Joseph's School on Leslie Street, at a cost of $6,000.

Winnipeg, Man.—The new Bank of Hamilton building for which tenders will be called in two weeks and on which work will commence shortly will cost about $500,000. J. D. Atchison, of Winnipeg, is the architect.

Toronto, Ont.—The Toronto Harbor Commission at a special meeting held on May 5, decided to grant a 21-year lease

Page 58
Contains some interesting Reading.

of Bayside Park to the T. Eaton Co., for a site for their proposed million-dollar mail order building.

Winnipeg, Man.—The Carter-Halls-Aldinger Co., of Winnipeg, have been awarded the contract for the extension to the Winnipeg Grain Exchange. Three more storeys are to be added to the building at a cost of $200,000. Work will be started at once. Messrs. Owen & Jordan are the architects.

Hamilton, Ont.—The Technical Committee of the Board of Education has decided not to begin the construction of the new Technical School until 1917. The site will embrace the property on Wentworth street known as Brown's nursery, and part of Britannia Park, the entire cost being about $75,000.

Toronto, Ont.—The Separate School Board have awarded the following contracts for St. Monica's school: McGregor & McIntyre, structural steel, $1,134; W. J. McGuire, plumbing, $2,945; P. E. Regan, heating, $3,125; Canada Electric, wiring, $197. For St. Peter's school: Reid & Brown, structural steel, $735; W. J. McGuire, plumbing, $895; D. Millar, heating, $200; Canada Electric, wiring, $87.

Trade Gossip

Nickel Refinery Plan.—When the International Nickel Co. plan for a refinery in Canada was first discussed it was understood that the company proposed to build on the Atlantic seaboard. Recently there has been talk of a refinery in Ontario, and New York reports state that two sites are under consideration—one at Toronto, and the other at Hamilton—and when a decision is made between the two, work will go ahead on a $1,000,000 plant. The obvious economies which would be offered by a refinery situated on the seaboard naturally make reasons for the change—if it is a change and not an extension of the original plan—rather obscure.

Stresses in Boiler Heads.—The Babcock & Wilcox Co., of Bayonne, New Jersey, through its representative, Isaac Harter, general superintendent, has presented to the Department of Mechanical Engineering of the University of Illinois, a 42-inch cylindrical drum to be used in an investigation which has been undertaken by the Engineering Experiment Station to determine the stresses in convex boiler heads. One head is provided with a manhole, and the other, the head to be tested, is fastened to the shell by specially designed tapered bolts to facilitate its removal and replacement by heads of different design. The shell of the drum is made unusually heavy to permit pressures to be carried above those normally used in practice.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

SIX-FOOT METAL PLANER FOR SALE—practically new. Apply A. Graham Boyd, 100 Front St. E., Toronto. (14)

TWO FOX TURRET LATHES FOR SALE—splendid condition. Ideal Foundry, 900 Gerrard St. East, Toronto. Phone Gerrard 1055. (15)

FOR SALE — ONE NEW FORD SMITH Grinder for Shrapnel. A short time ago we purchased five, find four will take care of our work. The National Manufacturing Co., Brockville, Ont.

1—2-SPINDLE SHAPER, WOOD TOP, JOHN Ballantyne, Preston, make. used two months. 1 Dynamo, 45 lights, Toronto and Hamilton Electric Co. make. Used five months. Good as new. Box 195, Jordon, Ont. (R.T.F.)

FORD-SMITH NO. 2 PLAIN MILLING MAchine; new; in perfect condition; ready for immediate shipment. McGregor & McIntyre, Ltd., 1139 Shaw St., Toronto. (16)

FOR SALE—FIFTEEN HUNDRED GALLON Duplex Steam Pump, used sixty days. Size twenty x twelve x sixteen stroke. Apply Fraser & Chalmers of Canada, Limited, Montreal. (12)

FOR SALE—GARAGE IN GOOD WHEAT district. Snap for a good, practical man. About forty cars in vicinity. Will sell cheap if taken at once. Address Box 74, Hanley. Sask. (13)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London. Ont.

1—C.G.E. TYPE 10—20 H.P. INDUCTION Motor—60 cycles, 220 volts, 45 amps.—1200 R. P.M., complete with Auto Starter. Pulley on Motor 12" Diam. x 10" Face. Cummer-Dowswell, Ltd., Hamilton, Ont.

FOR SALE—ONE NEVER-USED WESTINGhouse Motor, Type CCL, 5 H.P., 200 Volts, 16 Amperes, 3 Phase, 3000 Alts., 700 R.P.M., full load, equipped with starting compensator and frame and 6" pulley with 5" face. Canadian Machinery, Box 189. (16)

FOR SALE—PLANING MILL AND FACTory, doing good business. Terms $2,000.00 cash. Balance to suit buyer. Address O. Ribble, Bronte, Ont. (13)

FOR SALE — TWO GOLDIE-McCULLOCH Wheelock Engines—cylinders 16" diameter, 38" stroke; both engines now running, but will be replaced with Hydro-Electric. Engines guaranteed to be in perfect condition, and will be sold complete with belt wheels, one 14' x 35" face and one 12' diameter with 24" face, also belting if required. Canadian Consolidated Felt Co., Berlin, Canada. (19)

Machine Shop For Sale

IN MONTREAL

21 Machines adapted to shell work

$25,000 (19)

Box 187, CANADIAN MACHINERY
263 St James St., Montreal

FOR SALE

FOR SALE OR RENT—MACHINE SHOP AND foundry, with garage. Good machinery. good locality. Lots of cars and boats. Power and rent very cheap. Box 334, Carleton Place, Ont. (21)

FOR SALE—1 CLEVELAND ACME MAchine Co.'s 6" Cap. Single Head, Tapping Machine—back-geared, automatic feed, cone step pulleys and countershaft with two extra chucks. Particulars from Taylor-Forbes Company, Limited, Guelph, Ont. (13)

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double bandsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

ELECTRODES — THE PROPRIETORS OF letters patent No. 127080, relating to "Process of manufacturing iron for use in alkaline accumulators," and No. 127081, relating to "Active masses for positive electrodes of electric elements, etc.," desire to dispose of the patents or to grant licenses to interested parties at reasonable terms, with a view to the adequate working of the patents in Canada. Inquiries to be addressed to the actual proprietors, Svenska Ackumulator Aktiebolaget Jungner, Stockholm, Sweden. (13)

SITUATIONS WANTED

CHIEF ENGINEER — 26 YEARS' EXPERIence. Factory and Central Station, Alternating and Direct Current, Gas or Steam Engines, efficiency guaranteed, own instruments, best of references. Box 181, Canadian Machinery. (12)

AS MAINTENANCE ENGINEER OF FACTory, power or lighting plant, where economy is a factor, wide experience, best of references. Box 180, Canadian Machinery. (12)

REPAIRING

ALL KINDS OF MACHINERY REPAIRED, rebuilt and installed. W. H. Sumbling Machinery Co., 643 Yonge Street, Toronto, Ont.

SITUATIONS VACANT

WANTED—YOUNG MAN TO HANDLE ADvertising of a line of engineering equipment. Must be prepared to locate in a city of 15,000 population. Salary to start, $70 per month. Box 184, Canadian Machinery.

WANTED — MACHINISTS AND FLOOR hands on heavy and miscellaneous medium work; steady employment, modern shop, good wages. Apply, stating age and experience, P.O. Box 6, Walkerville, Ontario. (6)

WANTED — TWO FIRST-CLASS STEEL moulders. Apply Nova Scotia Steel & Coal Company, Limited, Sydney Mines, N.S. (15)

WANTED—OUTSIDE MACHINIST TO ACT as mechanical foreman on construction work. Apply to A. B., Canadian Machinery. (15)

WANTED — YOUNG CHEMIST WHO HAS had some experience in analysis of iron, steel and other steel plant products. Apply to X. Y., Canadian Machinery. (15)

WANTED—FIRST-CLASS BOILER MAN TO take charge of battery of water tube boilers, 1200 H.P., which will be increased. Should be familiar with steam engine and air compressor. Reply, giving particulars of experience and salary expected, Box 191, Canadian Machinery. (19)

WANTED

WANTED BERTRAM WAVING ATTACHment for 4.5 Shells, with or without Lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson Limited. (R.T.F.)

WANTED—HYDRAULIC PUMP, GOOD FOR 2,000 lbs. pressure capacity for 16" diameter cylinder press; belt-driven preferred. Canadian Consolidated Felt Co., Ltd., Berlin, Canada. (18)

ENGINEER WANTS AGENCIES FOR MONTreal and district. Side line or specialties, on commission basis. X.Y.Z., Canadian Machinery, Montreal. (19)

WANTED — BERTRAM WAVING ATTACHment for 4.5 shells, with or without lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson, Limited, Hamilton, Ont. (rtf)

BOILERS WANTED—TWO SECOND-HAND, about 150 H.P.; at least 80 pounds working pressure under Ontario Government Boiler Regulations. Give full particulars, Box 198, Canadian Machinery. (19)

FOREMAN WANTED WITH ABILITY and experience to take charge of plant making large size shells. Strictly modern factory with new machinery. Applicants only considered who are holding positions of responsibility and can give satisfactory references. State salary. Correspondence strictly confidential. Apply to Box 195, Canadian Machinery.

TOOL DESIGNER WANTED—TO DEsign a complete set of tools for machining 8" and 9.2" shells. Preference will be given to applicants who have actually had experience on shell work. New equipment throughout. Steady position and good salary. Correspondence confidential. Apply to Box 196, Canadian Machinery.

SUPERINTENDENT WANTED TO take charge of production in a new factory making large shells. Applicants must qualify by having proven their ability to carry out a large undertaking successfully. Salary according to ability. Correspondence confidential. Apply to Box 197, Canadian Machinery.

20 pieces pp. 429. 70

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, MAY 18, 1916 No. 20

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House. The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 22 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Machining and Assembling the Military Rifle Bayonet-II.

By F. H. Mayoh

Bayonet manufacture, like that of shells, has been both war-initiated and war-stimulated, although as far as we are concerned the latter has demanded and monopolized the full extent of our metal-working plant activities. Bayonet production, it will be noted, is quite distinct in its operation features from that of shells; as a result our readers will find in the accompanying articles a welcome diversion, besides obtaining at the same time a further insight into the manufacture of another and highly important piece of the individual soldier's equipment, offensive as well as defensive, and particularly effective in either case.

HAVING previously described the making of the bayonet blade, reference is made to Fig. 12 for details of hilt and guard crossing which are made from forgings.

The hilt of a bayonet is so made that it provides a good means of gripping

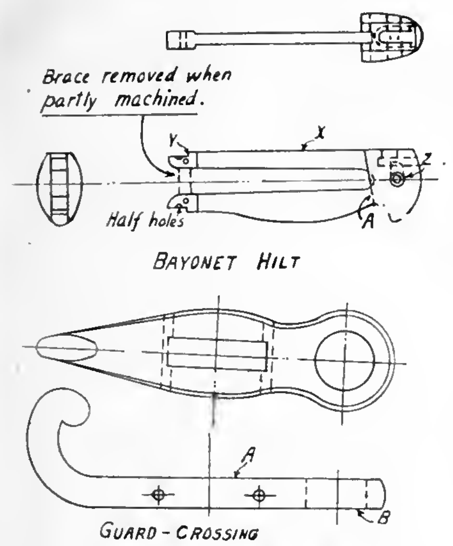


FIG. 12—DETAILS OF TWO IMPORTANT BAYONET PARTS

when used in the hand as well as being adapted for quick attachment to the rifle.

The guard crossing is made to provide some protection to the user of the bayonet and is part of the means for attaching the bayonet to the rifle.

As the hilt forging comes from the dies it has a brace across the open end as shown by the dot and dash lines. This brace is cut away after part of the machining is done.

The first operation on the hilt is to finish the back edge X, Fig. 12, and this is accomplished by disc grinding. This provides a starting point from which the other operations are located.

From the disc ground surface or back edge of hilt as a locating point a number of parts are set on end as shown by Fig. 13, and resting them on the angular surface A at sides, they are clamped against block B, by expanding Jaws C. A fixture full of these parts is milled at one setting by the use of a formed cutter D.

In locating the work in the fixture, Fig. 14, it is obvious that the work will be milled on an angle. At this time two cutters are used, one being a long surface mill for machining the side while the other is a short one which cuts out the recess in side long enough to permit the cutter that mills straight across the recess to clear the corner of the angle.

In this tool the work is located at A from the end previously machined and the disc-ground side is clamped against block B by bolt C, and strap D. One piece only is held in each fixture but two of these are mounted on a swivel plate side by side as shown by dot and dash lines in plan view. At the completion of cut on one part the table is indexed to bring the other fixture previously loaded under the cutter, thus providing continuous milling.

For milling the opposite side a fixture similar to that shown by Fig. 14 is used. This fixture, however, is made to the opposite hand; the two fixtures being known as right and left hand.

What proves to be a very economical fixture is shown by Fig. 15, this being used for milling form at end of prongs and the step. It will be noticed on this tool that two rows of hilts are set on ends using the back edge A and bevel at sides for locating. When placing the work in position the pins C (one for each part) are forced up and locked by screw D, springs being used to force the pins up. This holds the work against the locating surfaces while every two hilts are clamped against fixed block E by expanding blocks F, which are forced open by screw and tapered bushing G. This securely grips the work as there is but two thousandths of an inch variation in thickness allowed. As many parts as possible are placed in one fixture and these are rapidly milled with a gang cutter H.

To obtain the form at front edge of hilt a form milling cutter is run across the length and this edge is afterwards ground slightly convex. While form milling, the hilts are held in the fixture, Fig. 16, being located from back edge.

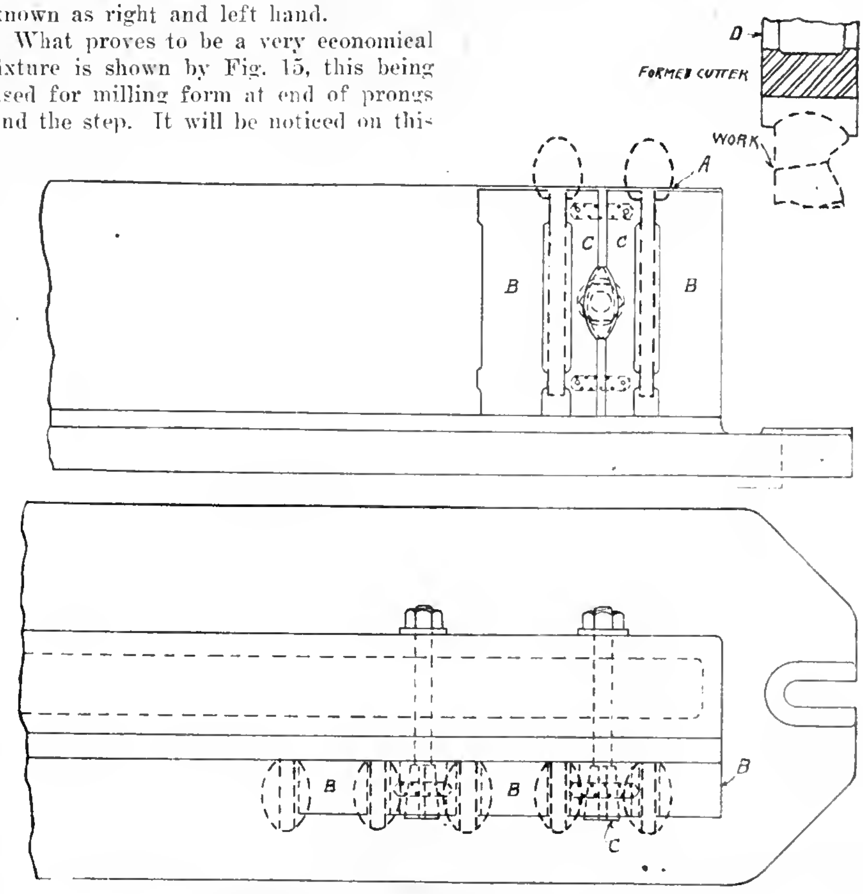


FIG. 13—MILLING ENDS OF HILT IN GANG FIXTURE

sides and angular surfaces while the clamping is done by expanding jaws A operated by stud B through eccentric and draw bar C in a manner which is readily understood from the illustration. The tee slots in hilt are cut on a vertical hand milling machine with tee slot cutter in the usual manner. A vise with special jaws being used which grip the work by the side.

In succession all holes in hilt are next drilled and counterbored and the slot Z Fig. 12, is milled out with an end mill while a small corner left by end mill is slotted out. These operations are profitably performed by using simple fixtures which adapt the work to various machines that are available.

To mill relief in sides of hilt reference is again made to Fig. 14 as similar tools are used with the exception that the work is held straight while feeding under cutter as shown in diagram Fig. 17. The work in this fixture is located from the bevel instead of from end as in the former case. The brace which has supported the open end of prongs is now milled out in a fixture of the same type as that shown in Fig. 15.

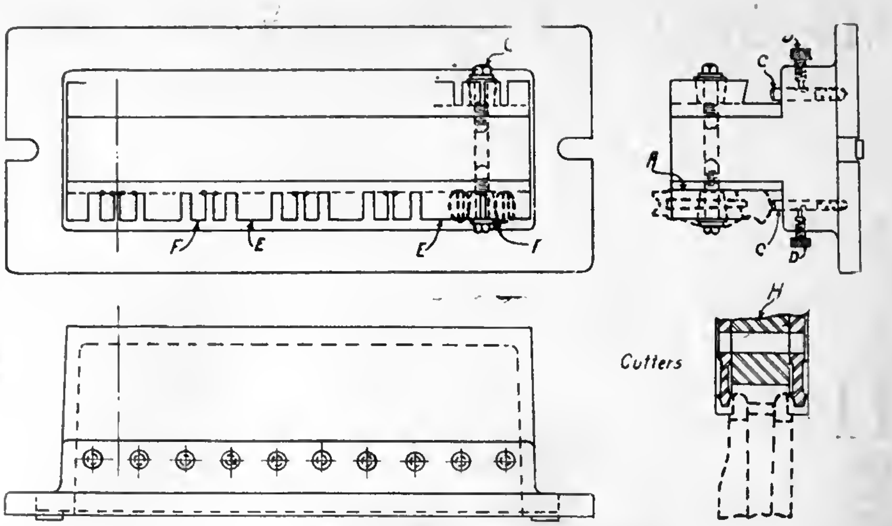
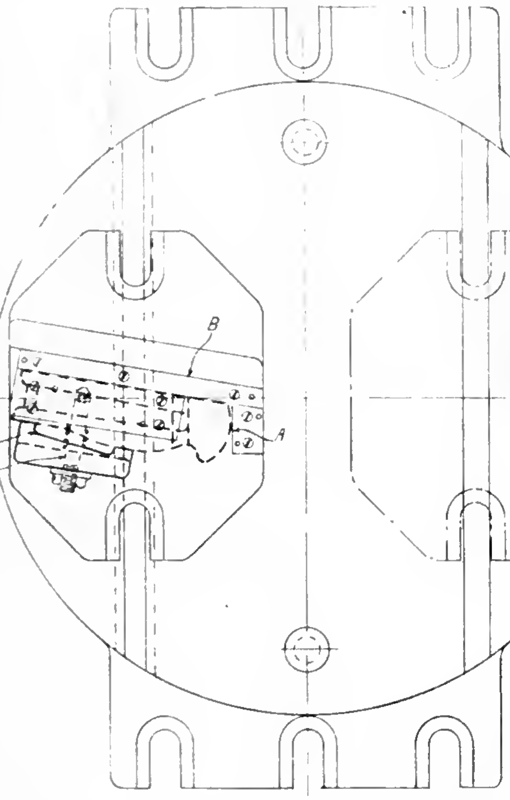


FIG. 15—GANG MILLING CUTTER FOR END

To mill the inside of prongs a fixture of more than usual interest is used to hold the hilt and this is shown by the illustration, Fig. 18. This provides for locating the work by back edge A and vee B on the side in block C. The screw D secures the work in the vee while the clamps on top securely hold both prongs under the cut. The fixture proper E is mounted on a plate and pivots on stud F. In this plate are two holes G and H, into which an indexing pin is fitted.



In operation the fixture is set with the index pin in one hole, after which the fixture is securely clamped by the bolt I. The cut is then taken down one side of the inside of prong with a formed mill held in a vertical spindle milling machine. Following this the fixture is indexed to the next hole and a cut is taken on the opposite side.

The final operations are hand performed and consist of grinding unfinished portions to shape, removing a small fin which is at open end of prong and is left by the previous operation, and removing all burrs by filing.

It will be noticed that there are two half holes in the hilt as shown in Fig. 12, and these are drilled when assembling bayonet.

The guard crossing, having to fit with the other parts of the bayonet in but one place in addition to fitting the barrel of rifle, more liberty can be taken with the machining of this part than with the blade and hilt.

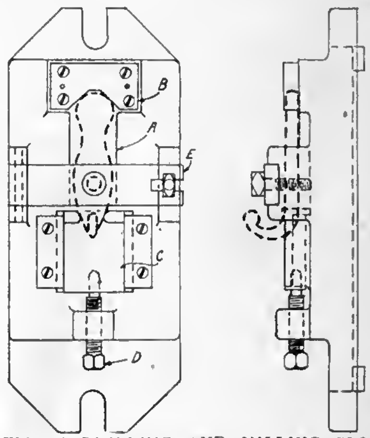


FIG. 19—DRILLING AND MILLING SLOT IN GUARD

The guard as shown by Fig. 12 is a mild steel drop forging restruck to make it fairly accurate to size and is machined as follows: The inner side A is disc

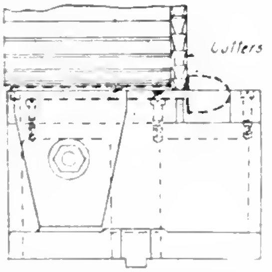


FIG. 14—MILLING SIDE OF HILT USING TWO FIXTURES ON A TURNTABLE

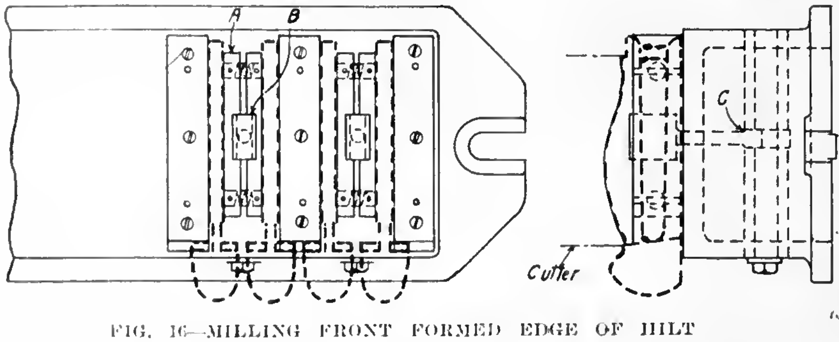


FIG. 16—MILLING FRONT FORMED EDGE OF HILT

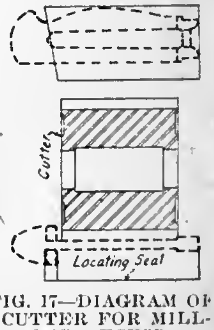


FIG. 17—DIAGRAM OF CUTTER FOR MILLING RECESS

ground and by laying a number of guards on a specially constructed magnetic chuck, the opposite side B is ground to thickness on a surface grinder.

Following these operations the guard is held in the jig, Fig. 19, and a hole is drilled as shown at A, Fig. 20. This is followed by milling the slot as shown in the middle view B, with end mill in vertical milling machine, both of these operations being performed in the same tool, Fig. 19. This fixture is used in the following manner: After laying the guard as shown in the illustration on pad A, and locating round end in vee block B, the work is clamped by means of the sliding block C operated by the screw D. For guiding the drill a swinging cover E is used which contains a guide bushing and this is swung out of the way when milling, thus permitting the use of a short stiff end mill for cutting the slot.

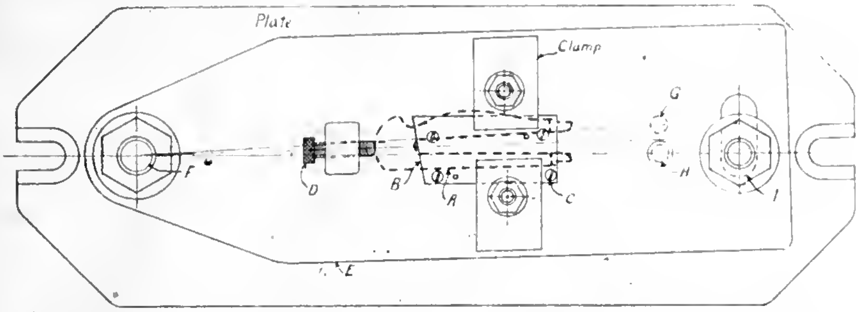


FIG. 18—PLAN VIEW OF FIXTURE FOR MILLING INSIDE OF PRONGS

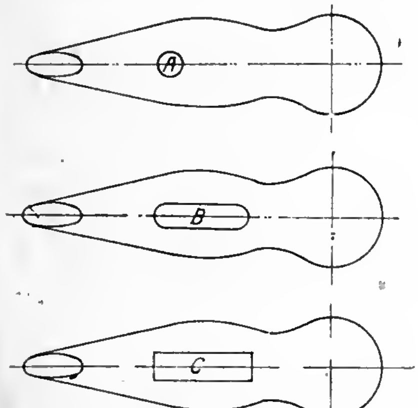


FIG. 20. DIAGRAM OF OPERATIONS ON SLOT IN GUARD.

The guard is next broached in the usual manner by drawing a long broach through the hole roughed out, thus leaving the hole with square corners as shown at C, Fig. 20. The outline of guard is now trimmed by grinding in the usual manner as required to finish off a rough forging.

To insure accurate assembling of the completed bayonets the three remaining holes (two small half holes and large hole) are drilled at assembly.

The assembling of the bayonet is done in a simple and effective manner while permitting an easy means of taking same apart and it would not be a difficult matter to pick up any part of a bayonet on the field to repair a broken one. With the exception of the parts previously described the other details are shown by Fig. 21.

To commence assembling the two plates A, Fig. 21 are pinned in place at A, Fig. 22, and following this the guard crossing B is forced in place, after which the tongue of bayonet blade C is positioned as shown between the plates.

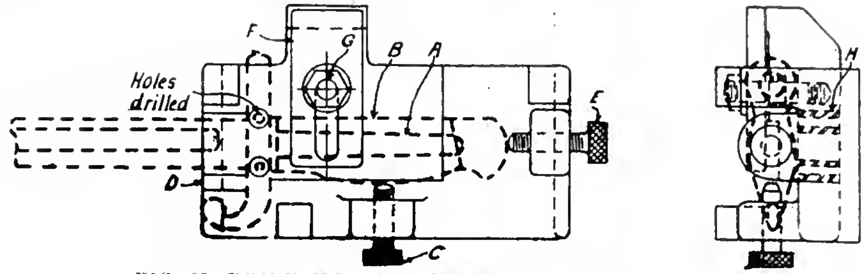


FIG. 23—DRILL JIG FOR ASSEMBLING GUARD TO HILT

To prevent the blade from pulling out of hilt a pin D is driven through the bayonet tongue to butt against edge of plates.

The holes E are drilled in jig, Fig. 23, at which time the hilt rests on seat A, pushed over against back edge B, with screw C. The guard sets against block D, and is held there by screw E at end of hilt which also forces hilt into guard. The clamp F and screw G hold the work in place while the jig is turned over and the holes are drilled through bushings H on the under side which guide the drill.

Having the blade, hilt and guard securely fixed in place, we proceed to drill the hole in the guard which fits over the rifle barrel, this having been left till the last so it could be located from the tee slot in hilt, which also fits the rifle.

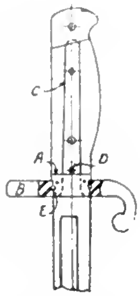


FIG. 22—METHOD OF ASSEMBLING HILT

The jig for this purpose is made in two parts owing to the length of blade, and consists of a template A, Fig. 24, and a block B, on which the work is set. This template jig is made to slip over bayonet hilt with C located in tee slot until the surface D rests on guard crossing, in which position screw E holds the jig back against the edge of hilt. The jig and bayonet are now set on the block B in the drill press and the hole is spotted, drilled and reamed using the bushing F for guiding the tools.

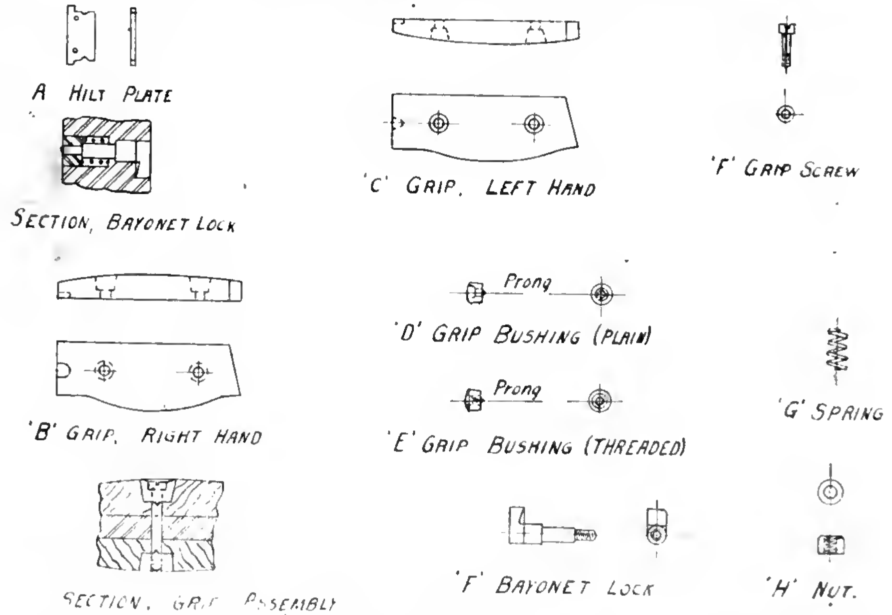


FIG. 21. DETAILS USED TO COMPLETE BAYONET CONSTRUCTION

The main parts of the bayonet being now taken care of it is only necessary to assemble the grips and bayonet lock.

Again referring to Fig. 21 for details of these parts, the grips, one right and one left hand, are next put in position

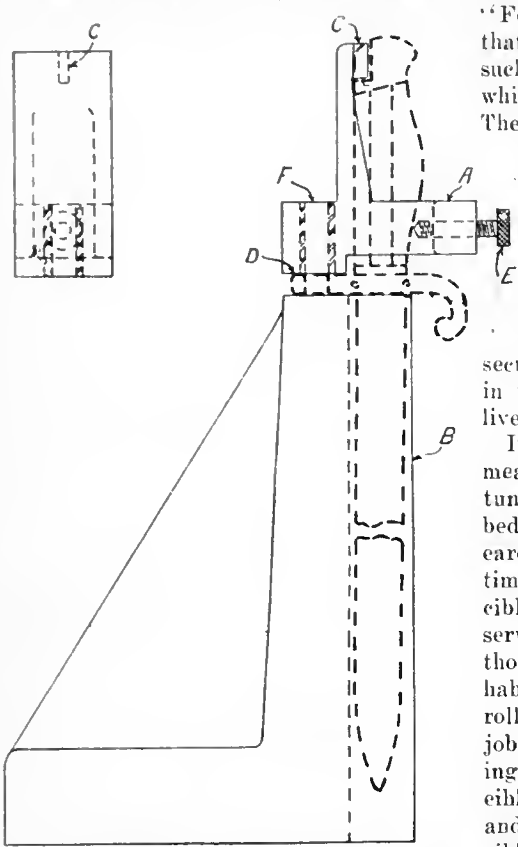


FIG. 24—JIG AND BLOCK FOR DRILLING HOLE WHICH GOES OVER RIFLE BARREL

and held in place with two of the screws shown, also one each of the bushings are used with each screw, a plain drilled bushing at the head end and a threaded bushing at the opposite side as shown by the section "grip assembly." It will be noticed that a short prong is made on each bushing so they will embed in the grips when the screw is tightened

The assembling of the lock is shown in section and the various details, locking bar, spring, and nut are assembled in the order named and require no special mention all of these small parts being made in the usual manner for screw machine parts.

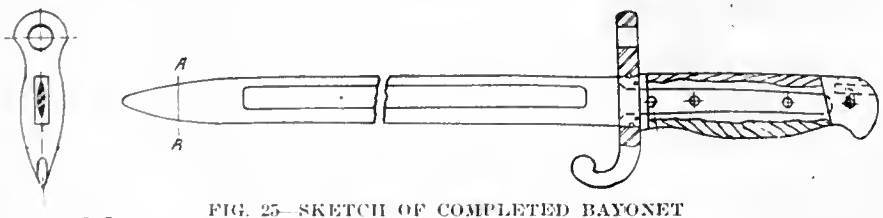


FIG. 25—SKETCH OF COMPLETED BAYONET

The assembled bayonet complete in detail is illustrated by Fig. 25, this result having been quickly and accurately obtained in a way which insures interchangeability of product between parts of the bayonet, and between the bayonet and rifle which is very desirable and in line with modern gun work.

CRUCIBLES

THE life of the Crucible Maker is not the halcyon, care-free existence that "Foundry Folk" possibly have in mind that it is. Leastways it has not been such for many, many weary months, which have been mostly dark nights. The proper clays and the securing of such in sufficient quantities is what has troubled the crucible maker. This, in fact, is "The Crucible Rock" upon which all their hopes and efforts have been wrecked. But at last the sky is clearing. Clays of more satisfactory sorts have been secured, and with their use better results in the foundry will be had and longer lived crucibles will result.

It rests, however, with the user, in a measure to improve the present unfortunate state of affairs and this can bedone in the following ways:—Greater care must be given in annealing—more time must be consumed, after the crucible is received, before it is put into service, and smaller crucibles used than those which the foundry has been in the habit of using. In past years all brass rolling mills, crucible steel casters and jobbing shops thought nothing of having six months or a year's stock of crucibles ahead of their wants—seasoning and drying. To-day, no sooner is a crucible received then it is put into active service.

The native clays now used by the crucible maker have made the crucible more frail and tender than were those made from foreign clays,—more likely to crack on sudden heating and cooling. Therefore, more than ordinary care must be used by the melters in the handling of American clay made crucibles.

Crucibles should not be cooled down too rapidly, any more than should the heating up be done too quickly. It is a good plan to return the crucible while it is still hot, after the day's work is done, to the furnace from which, of course, the coal has been dumped. By doing this, the strain in the cooling will not be as severe and the crucible will not crack so early in its life.

The smaller the crucible is the greater are the number of heats that can be secured. Therefore if a crucible of a size or two smaller than what is generally used is adapted, better values and less disappointments will be the results. For instance, if a foundry uses a No. 400 pot, let them adopt a No. 300 or a No. 225, or in a shop where No. 60's are the rule, let it be a No. 45 or a No. 50. In this way both caster and crucible maker will be relieved of the hundreds of annoyances and complaints that for the last few months have made their bed—one of roses, with the petals, buds and flowers all plucked off.

CONCERNING ANTIMONY

A BRITISH Consular report contains an interesting reference to the effect of the war upon the supplies of antimony:

The war, says the report, had not been long in progress before it became evident to all concerned in the manufacture of explosives that the Province of Hunan in China actually controlled the total visible supplies of antimony then existent, and in order to obtain this much-needed metal, Hunan prices would have to be paid for it. Before the war the value of antimony regulus on the London market was about $125 per ton. It had long been assessed by the Chinese Customs for the purpose of export duty at about $50 per ton. The price has now risen to over $500 per ton, but the Customs rate remains the same.

Previous to the outbreak of the war the whole output of the pure metal, as refined by the Hua Chang Co. of Changsha, which enjoyed a monopoly of the manufacture of regulus in Hunan province, was controlled and marketed in London by a British concern, under a time contract. In times of peace and normal prices, this arrangement offered many advantages to the Chinese manufacturers, but after the outbreak of the war their interests lay in quite another direction. Temporary banking difficulties having arisen with the war, the Chinese refiners of the metal seized the opportunity to denounce the contract.

Soon afterwards market quotations for standard metals were stopped in the United Kingdom, and the export of antimony prohibited. Owing to the use made of it for the manufacture of munitions of war, it was declared to be contraband, and its transport by land or sea closely watched and restricted. The area within which it was produced in France was invaded by the Germans, and thus cut off from the world at large, as was also the output from Austria-Hungary. The Bolivian and Mexican mines having closed down, only two or three minor sources of direct production remained as possible competitors to the one important producing area left, that is to say, the Chinese Province of Hunan. From both foreign and Chinese sources of information, the real state of affairs soon became known to all the Chinese interested in the trade, and when an urgent demand arose in Japan, Russia, America and the United Kingdom, the Chinese seized their opportunity, held up supplies and concerned the market

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

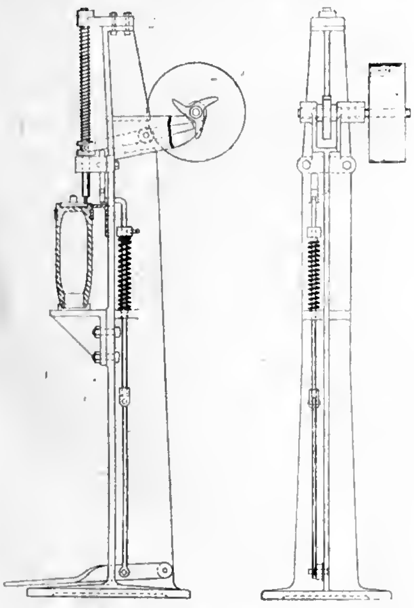
HOME-MADE RIVETER FOR SHELL PLUGS

By H. P. Hoag

THE riveting machine shown in the drawing was brought out to rivet gas plugs in 4.5 shells and owing to its simplicity and efficiency the writer believes it will be of interest to others on a similar line of work.

The action is as follows: The vertical spindle is lifted by the horizontal lever and the three-lobed cam on shaft at back and is allowed to fall by its own weight plus the pressure exerted by the spring on the upper end of spindle.

No countershaft is required as the cam shaft with pulley may run continuously by being belted direct to line shaft. The hammer is started simply by pressing down on the foot lever which releases the horizontal lever reaching from cam to vertical spindle. When the foot



HOME-MADE RIVETER FOR SHELL PLUGS.

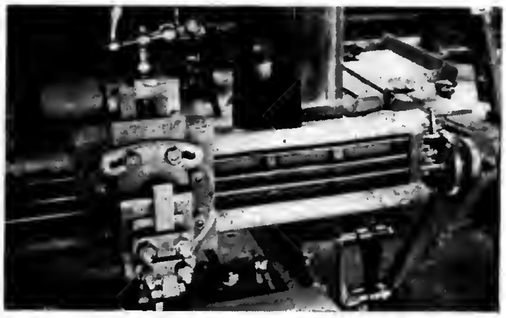
lever is up the horizontal lever is held out of action of the cam by a rod and stiff spring shown on drawing.

Speed of pulley is about 200 per min., giving 600 blows per min. The machine has an output of 100 shells per hour.

CROSS-CUTTING ON A PLANER

By D. A. Hampson.

THE photograph shows a rig for taking light cuts at right angles to the normal cut of a planer, i.e., across the table. This same arrangement would not work on another kind of planer drive, but with the machine being considered, it is ideal. The usual open and crossed belts drive pulleys that are connected to the first shaft by clutches giving the ordinary reverse, and a clutch on the shaft can be thrown out to cut out the table movement and apply power to the pulley raising the cross rail.



CROSS SLIDE ON PLANER ARRANGED FOR TRANSVERSE MACHINING.

By slipping off the power elevating belt, we had a reversible shaft in line with the cross-feed screw, and by putting a pulley on each and belting them up, we had a power cross-cut with sufficient power to take a chip ½ in. wide and 1/64 in. deep in cast iron.

Some of the work was surfacing cast iron plates that would just pass through the housing when bolted down the one way, but were too long to pass the other way. Slots were required across the castings in several places, and the power cross-cut was a means to do all the cutting at one setting, and avoided the use of an extension head, making a nice saving of time.

ELECTRIC FURNACES

RAPID progress is being made in the adoption of electric furnaces by metal manufacturing concerns in Britain, a number of units for ferrosilicon as well as steel having been recently installed by the Snyder Furnace Co., Chicago. During a recent visit by W. K. Booth, vice-president of company, four ferrosilicon furnaces were installed in a remodeled plant, having a power consumption of 1,800 k.w. and producing silicon with a purity of 97.25 per cent. Recent British purchasers of Snyder electric furnaces include: Thwaites Brothers, Bradford, two 12-ton basic furnaces; Thos. Summerson & Sons, Darlington, one ditto; Daimler Motor Car Co., Coventry, special grey iron furnace for automobile cylinder castings; National Steel Foundry Co., Leven, Fife, special 5-ton basic furnace.

QUESTIONS AND ANSWERS

Question.—When the centre of an arc is not available, as in a large fillet or broken wheel, how can the radius of arc or diameter of wheel be determined?

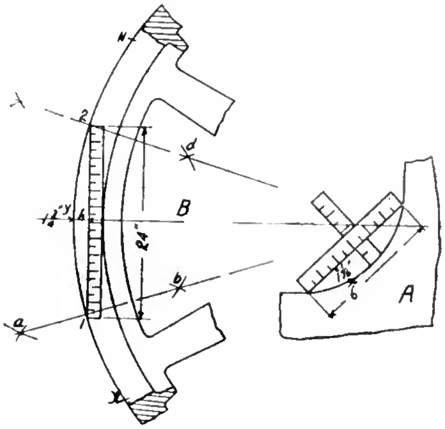
Answer.—A good rule to calculate the diameter of a fillet when only a section of the circumference is available is to divide the sum of the square of the height and the square of half the chord by the height. For example, in the sketch of the fillet shown at A a six-inch rule is laid across the fillet and the height of the opening is found to be 1 1-16 inches. From the above rule the diameter would be

$$\frac{3^2+1.0625^2}{1.0625} = \frac{10.129}{1.0625} = 9.533 \text{ inches.}$$

The same rule applied to the flywheel section shown at B would be

$$\frac{12^2+1.75^2}{1.75} = \frac{147.06}{1.75} = 84.04 \text{ inches.}$$

The centre of the arc can be determined graphically by selecting three points on the circumference, as x, y, z.



Bisecting these distances as shown, the intersection of the produced lines will be the centre of the arc or circle of the original wheel.

* * *

Question.—What is specific gravity, and how can it be used to calculate the weight of different substances?

Answer.—The specific gravity of a body is the ratio between its weight and the weight of a like volume of distilled water at a temperature of 39.2 deg. F. To find the weight of any liquid or solid, when its specific gravity is known, multiply the specific gravity by 62.5, the weight in pounds of a cubic foot of water. For example, if the specific gravity of cast iron is known to be 7.21, the weight of a cubic foot would be 7.21

$\times 62.5 = 450.6$ pounds; or weight per cu. inch would be $450.6 \div 1728 = .26$ pounds or 4.16 ounces.

* * *

Question.—What would be the weight of the metal forming the fillet in the right angle corner of an iron casting, radius of fillet being $1\frac{1}{2}$ inches and the total length $7\frac{1}{2}$ feet?

Answer.—The area of the cross section of the fillet would be one-fourth the difference between the areas of a 3-inch square and that of a circle 3 inches in diameter, or $\frac{1}{4}\ [9 - (3^2 \times .7854)] = .483$ inches. Volume of metal would be $7.5 \times 12 \times .483 = 43.47$ sq. in. Then weight would be $.26 \times 43.47 = 11.3$ lbs. .26 is the weight in pounds of one cubic inch of cast iron.

* * *

Question.—With a tensile strength of 60,000 lbs. per sq. inch, and a factor of safety of 5, what would be the limit of load on a ⅝ rod?

Answer.—With the above safety factor of 5, the limit of load would be 60,000 lbs. divided by 5, or 12,000 lbs. per sq. inch. For a ⅝ rod this would represent a load of $12{,}000 \times \frac{5}{8}^2 \times .7854 = 3684$ pounds.

* * *

Question.—With the cutting tool set level with the centre, what fraction of a turn would be required by the cross feed handle to remove 1-16 inch of stock on the diameter, cross feed screw having six threads per inch?

Answer.—To remove 1-16 inch of stock will require an advance of the cutting tool of 1-32 inch. As the pitch of the cross-feed screw is 1-6 inch, the fraction of a turn will be $1\text{-}32 \div 1\text{-}6 = 3\text{-}16$ of a revolution of the cross-feed screw.

* * *

Question.—When preparing dies for hardening it is often desirable to fill small holes with non-combustible material, to avoid loss by breakage. What is the best method to remove this filling from small threaded holes?

Answer.—In many cases it will be found that the hardening process has reduced the size of hole to a degree where it is difficult to clean the threads out with the tap. If the original tap is used, there is danger of breaking, and in any event it is not advisable to do this, as the hardened die will have a tendency to wear the tap, thus altering the size. An old worn tap may be used; or by taking the proper size screw and cutting a groove across the threads the tapped hole can be cleaned out very readily.

* * *

Question.—With a belt speed of 380 feet per minute on a 9-inch cone pulley, and a gear ratio of 8 to 1 between the cone and the spindle, what time would be required to travel over a $9\frac{1}{4}$-inch diameter shaft, 27 inches long, with 1-16-inch feed; and what would be the cutting speed in feed per minute?

Answer.—With a belt speed of 380 feet per minute the speed of the cone pulleys would be 380 divided by the circumference of the pulley in feet or $380 \div (\frac{9}{12} \times 3.1416) = 118.8$ rev. per min.

With a gear ratio of 8 to 1 the speed of work or lathe spindle would be $118.8 \div 8 = 14.85$ revolutions per min. The cutting speed would be number of revolutions multiplied by the circumference, or $14.85 \times \dfrac{9.25 \times 3.1416}{12} = 35.9$ ft. per minute.

Time required to travel over 27 inches of shaft will be the length divided by the feed, and again divided by the revolutions, or $\dfrac{27 \div 1\text{-}16}{14.85} = \dfrac{27 \times 16}{14.85} = 29.09$ min., practically one-half hour.

* * *

Question.—To lighten a large iron punch casting, which was giving trouble on the press, it was necessary to drill a number of holes to reduce the weight; 48 flat bottom holes, 1⅜ inches in diameter, were drilled to a depth of $1\frac{1}{4}$ inches. What weight of material was removed?

Answer.—The volume of each hole will be the diameter squared multiplied by .7854, multiplied by the depth, or $1.375^2 \times .7854 \times 1.25 = 1.86$ cu. in. Then volume of 48 holes will be $1.86 \times .48 = 89.28$ cu. in. With iron weighing 26 lbs. per cu. in., the weight removed would be $.26 \times 89.28 = 23.4$ pounds.

* * *

Question.—On a piece of shafting, 11 inches long, it is required to cut a groove having 16 complete turns; if the lead screw of the lathe is 4 threads per inch and the gears advance by 4 teeth, what gears are required to cut the desired groove?

Answer.—With 16 turns in 11 inches, the pitch of the groove will be $11 \div 16 = 11\text{-}16$ inch; or the number of threads per inch will be $16 \div 11 = 1\ 5\text{-}11$. With a lead screw of 4 threads per inch, the ratio between the work and the lead screw will be as 1 5-11 is to 4, or $1 : 2\frac{3}{4}$. Then the gear wheels must have the same ratio, and as they advance by fours, try 24 for the lead screw gear. This will give for the spindle gear one of $24 \times 2\frac{3}{4}$, or 66 teeth. However, as this is not divisible by 4, we will select 32 as the gear for the lead screw, which gives $32 \times 2\frac{3}{4}$, or 88. Then the wheels required are 88 on the spindle and 32 on the lead screw.

Proof—$88 \times 1\ 5\text{-}11$ should equal 32×4, then $88 \times 16\text{-}11 \div 32 \times 4 = \dfrac{88 \times 16}{32 \times 4 \times 11} = \dfrac{1408}{1408} = \dfrac{1}{1}$

* * *

Question.—When grinding twist drills, what are the chief points to be considered?

Answer.—For the successful operation of twist drills many details should be given attention; in fact, the proper grinding of twist drills is one of the essential details in machine shop practice. When possible gauges should be used to obtain the proper angle and length of each cutting edge. This angle should be about 59 degrees and the length of both cutting edges should be equal. In addition to this, the clearance should be equal on each side, and should be about 12 degrees. With an experienced drill operator these points are very accurately determined without the use of gauges, as the trained eye and hand performs the work almost perfectly.

* * *

Question.—What is the difference between the terms stress and strain?

Answer.—Stress is that force within a body which resists the action of an externally applied force; while the strain is the deformation, or change of shape, produced by the applied force, and is proportional to the stress within the elastic limit.

SUBSTITUTE FOR SULPHURIC ACID IN PICKLING

A CIRCULAR issued by the Research Mfg. Co., Philadelphia, points out that the elimination of sulphuric acid fumes is accomplished and many other advantages are attained in the pickling of metals for the removal of scale or oxide by the use of a compound which was perfected in the mills of the Ellwood Ivins' Tube Works, Philadelphia. It has been in use in the tube works for some time, but until recently was held as a shop secret. It has been named Edis Compound.

The compound is shipped in the form of dry cakes or lumps which are dissolved in water almost up to the boiling point. It is essential that the solution be very hot, and when being worked about 200 deg. should be maintained. To accomplish this end, the Research Mfg. Company suggests that the free end of a live steam pipe be inserted into the pickling tub, letting the steam condense in the solution. Where the tubs are very long the pipe may be tapped in several places. A piece of copper pipe should carry the steam into the solution.

It is also recommended that the tubs be covered, as this serves to keep the solution hotter, though this is entirely a measure for economy. It is pointed out that it is desirable to make the covers in sections to permit of easier handling. The solution is applicable to iron, steel, brass, copper, etc.

NEW PROCESS DEVELOPMENTS

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

EVOLUTION OF THE CUTTING EDGE

In the course of a carefully prepared paper, contributed to the "Iron and Coal Trades Review," Albert Middleton traced the evolution of the cutting edge from the earliest times, and the various methods adopted to secure its efficiency.

Coming down to modern times, the author said that in an article published some time ago in the above periodical, he embodied the results of a research made on some Chinese native made tools. It was pointed out that in a certain crudely made native razor of about 0.70% carbon steel, the value of its cutting edge lay in the fact that, speaking from a micrographic point of view, the edge in the finished condition being composed of an unsaturated steel, not hardened and tempered at a very high temperature, presented minute alternations of ferrite and solid solution—or, in other words, uncarbonized and carbonized material—and these softer portions wearing down below the others, leave the harder portions outstanding as teeth.

Modern Research Revelations

Modern research, however, has revealed the fact that the finest type of razor edge is secured by the adoption of a supersaturated steel, say, 1.40 per cent. carbon, which, by the mechanical treatment it gets in the forging operation, at a temperature where the cementite begins to separate out progressively, has that cementite broken up by the hammer into finely disseminated granules, the result being that when care is exercised not to interfere with this structure in the subsequent hardening and tempering processes, the edge of the tool presents extremely hard, alternating areas of cementite and solid solution, which, on account of the different hardnesses of these constituents, wear down unequally in the subsequent sharpening processes, and present extremely minute outstanding teeth, or really a finely serrated edge. It will be seen from the above that if the razor were hardened at a temperature where all the cementite thus formed passed again into solid solution, this effect would be destroyed.

Whetting a Penknife

It is interesting to note the effect of whetting a fine penknife blade, as seen under the microscope. Before whetting, the edge presents irregularities due to the comparatively coarse abrasion received from the grindstone, and, moreover, shows no minute bevel towards the edge, being practically a plane surface from edge to back. The function of whetting on the beautifully smooth stones used for the purpose takes away this irregularity, and, what is more important, yields a very fine bevel on the edge itself, finishing off by a very delicate operation which the grindstone itself is too coarse to perform.

The appearance of a newly-whetted penknife blade under the microscope shows the bevel and also the fine lines of whetstone abrasion running in one direction. It is actually doing, on a small scale, what hollow and double-hollow grinding on razors effect on a larger scale, namely, by scooping out or otherwise taking away the superfluous material to present an ultimate edge the two sides of which meet at a more acute angle than would be otherwise possible. Sometimes too great elasticity is presented by these extremely thin blades, with the result that it is found that for heavy shaving a blade of the flat ground type is preferable.

Present Day Applications

The present-day modifications and applications of the cutting edge are legion. In addition to the combined knife and saw edges achieved in such implements as file-cut sickles, bread knives with undulating edges, file-cut spiral cutters as used in textile works for shearing the nap of velvet, carpets, etc., we have quite another type of edge in the machine shear blades used for cutting cold thick masses of steel and iron. In these monster tools the edge is necessarily almost at right angles with the blade, the blade itself being anything up to, say, 2 ins. thick. In these cases the shearing action is largely supplemented and reinforced by the crushing effect imposed upon the blade, which forces apart the material and overcomes its resistance by sheer weight.

It is quite obvious that the cutting principle here is different from that of a keen sharp edge severing fibrous material. Tenacity and consequent avoidance of brittleness are naturally an essential feature in the composition of such shear blades, and the carbon of the steel from which they are made is, therefore, purposely kept moderately low. The same principle is utilized in the high-class punches which are used for punching holes through thick, tough, nickel-steel plating. The tool, though really a punch, has its edges made at a slight angle, to secure a slight shearing effect, and a start having thus been made, the pressure behind the tool forces out the material with a report like a pistol shot.

A similar action also takes place with the circular hot saws used for cutting red hot metal. In this instance the combined ripping effect of the teeth, and the forcing by pressure of a tool of superior hardness through a medium of lesser hardness, produces the separation of the red hot metal. These complicated necessities of modern industry naturally throw an additional burden upon the steel maker, who has had to exercise his ingenuity to evolve materials that will cope with these excessive requirements, and in many cases the various alloyed steels have been used with remarkable success, this being where the expert knowledge of the steel metallurgist serves him in good stead.

Alloy Steels

These special adaptations of alloyed steels constitute quite a modern departure, for though alien metals have been found in steel from the earliest times, their occurrence has been of an accidental nature in most cases, the metal having emanated from the iron ore itself. This no doubt explains, at least in part, the special value attached to certain ancient steels; for example, nickel has been stated to have been found in old Toledo blades.

The scientific application of non-ferrous metals to steel, leading to an exact knowledge of their precise ultimate effect on the working capacities of various tools, and coupled with the application of the intricate heat treatments, has resulted in the production of such wonderful tools as the pneumatic chipping chisel, resisting shocks that would have been undreamt of in Huntsman's day, and those milling cutters of complicated section which the tap of a hammer would suffice to shatter, and yet which will worm their way through the toughest steel. These alloyed steels have finally culminated in that marvellous product of the present day—high-speed steel.

High-Speed Steel

It is, indeed, a far cry from the flint of the savage to the high-speed lathe tool of the modern engineer, not only in the amount of work performed, but in the manner in which the result is obtained, and were it not for the service rendered by the microscope, and the involved researches made by latter-day metallurgists amongst the varied fields and systems of heat treatment, we should still

be practically in the earbon steel age.

The discovery, however, that certain essential critical points of a high-speed steel occur in a much higher range of temperature than do those of carbon steels; and that, moreover, these points, instead of developing suddenly, as in the pearlite to solid solution calescence of a carbon steel within the limits of a very few degrees, only develop progressively over a very wide amplitude, make it possible for such a lathe tool to be put to work on a shaft, and to turn off material so heavily and rapidly that the nose will become red hot without detriment to its working capacity. This seeming paradox is due to the fact that the temperature obtained at a low red heat is under the actual temperature required to exceed the change point of the steel, and reduce it from the hardened to the unhardened condition.

In conclusion, it is interesting to note that the modern milled twist drill, that highly ingenious tool, with its delicate spiral, its beautifully accurate and carefully calculated cutting angle and backed-off edge, shaped with the utmost mathematical precision, is merely another adaptation from Nature of the methods of such creatures as the pholas, this small mollusc boring its way through rock by rotating its shell round a fixed point.

FAULTS OF THE SMALL ELECTRIC ARC FURNACE

by W. M. McKnight

THE small electric arc furnace is rapidly coming into favor for the production of small highly-refined steel castings, and its advent is welcomed by both the manufacturers of steel castings and the electric power companies. Without going into the merits of the electric furnace as a competitor of the crucible and open-hearth furnace as to the quality of the product or regarding it as a welcome load builder for power companies, I wish to point out some of the handicaps to its universal adoption and successful operation.

The furnaces that are now in operation in several sections of this continent, while differing in some respects in the mechanical construction and electrical demands, all refine the steel by the same chemical process—by raising the temperature of the bath to 2500 deg. C. or better, by boiling the metal to eliminate the impurities, and by the introduction of the necessary refining agents to bring it up to the fineness desired.

Construction and Efficiency

All small arc furnaces are constructed on certain general mechanical lines, as follows: The furnace consists of a steel shell mounted on trunnions for tilting to discharge the molten metal. This jacket is lined with a slightly refractory lining, sufficiently thick to retain the heat; the lining and shell, however, are pierced with port-holes for the purpose of charging the furnace with steel, adding the refining agents, discharging the refined metal, and for inserting the electrodes, and all these port-holes furnish avenues of escape for the heated gases. The electrodes are secured in place by the holders mounted on the tilting shell, and the holder raises or lowers the electrode by hand operation, by hydraulic control or by electric motor control.

In spite of the fact that the electric furnace, to-day, is turning out small castings of a better quality and at a lower cost than by other processes, nevertheless, the over-all efficiency of the best furnaces on the market is far from 100 per cent. There are three principal sources of loss:

Sources of Loss

Electrical.—In the improper delivery of the energy to the metal.

Mechanical.—In the improper design of the furnace shell and ports, to exclude cold air and retain the heat.

Chemical.—The improper combinations of refractory materials, that should be inexpensive in first cost, withstand the intense heat long enough to avoid delays through the interruption of the manufacturing process and not introduce any chemical combination with the metal. Also, there should be found an electrode that will not waste away too rapidly through oxidation, within and without the furnace, as it comes in contact with the air and gases.

Electrical conditions can be improved by supplying the proper current at the proper potential. Mechanical conditions can be improved by re-designing detail portions of the furnace. The chemical conditions can be improved only by exhaustive research and careful study.

Refractories are of two kinds: the heat-resisting linings and the heat-producing electrodes. The heat-resisting linings may be either acid or basic, depending on the degree of heat required for the quality of steel to be turned out. The heat-producing refractories may be either carbon or graphite.

Temperatures and Lining

Merely to melt down steel scrap and turn out castings of semi-steel and low-grade castings of unknown quality does not require a temperature of 2500 deg. C., and for a furnace for this class of work an acid lining of silica is successfully used. To refine the steel, however it is necessary to use a basic lining of magnesite, at least where it comes in contact with the bath, or where the heat would be intense enough to melt down the silica and cause it to run down into the bath and combine with the metal bath or slag and the basic lining thereby changing their character.

The furnace linings can be placed in two ways: Built up with brick work, the bricks made to conform to the shape of the shell and laid up in a basic paste or coal tar binder, or the material for the lining may be made up into a mass and rammed into the shell. The brick lining offers some advantages, inasmuch as it has passed through a glazing process that should prolong its heat-resisting qualities, but it is expensive, particularly if special sizes and shapes are desired, and if the source of supply is remote, and the delivery uncertain.

The rammed lining should be superior from the fact that it is, if properly put in, a monolithic mass, hence there should be little danger of the bath breaking through to the shell, with the resulting damage to the furnace and loss of the batch.

Electrodes and Their Loss

Electrodes are of two kinds—carbon and graphite. Each has its merits. The carbon electrode is the less costly, but has less electrical carrying capacity than graphite, and consequently must be greater in cross-section to deliver the same amount of energy. It therefore has a larger amount of radiating surface, and consequently the saving in first cost of the carbon is offset by the loss in energy dissipated in heat. Owing to the intense heat of the electrode, its surface both within and without the furnace shell loses carbon by its surface contact with the air and resulting oxidation.

The graphite electrode, by virtue of its greater carrying capacity, is smaller in diameter, and offers less surface for radiation of heat and oxidation. The electrode within the furnace shell is subject to further attack by the passage of the electric current through the heated gases to the lining, which, at a temperature of 2500 deg. C., itself becomes a very good conductor of electricity.

Electric steel castings may be better in quality than those turned out by skilled operators with fuel furnaces, but small electric steel castings can be made at a less cost under present conditions, which conditions could be improved, and then the furnaces will be limited only by the capacity of the source of the supply of electrical energy. The field has apparently no limitations, if the chemist can overcome the losses I have pointed out. Formulate a better refractory lining, an electrode that will not waste away except in heating the bath, and utilize the waste gases by manufacturing them into a by-product or by-products.

This certainly is the day for the chemist, and his greatest achievements will be in the electrochemical field. From a paper read at the Annual Meeting of The American Electro-Chemical Society, Washington, D.C.

CONTEMPORARY WAR ARTICLES

Embracing Information and Data Drawn from a Variety of Sources Relative to and Arising from the Prosecution of this Many-Sided European War

SHELL MACHINING EQUIPMENT

Two complete series of lathes for machining 18-pdr. and 4.5 in. high explosive shells have recently been designed by E. R. & F. Turner, Ipswich, England. The 18-pdr. series embraces fourteen machines, the power to drive same requiring a 15 h.p. motor. The 4.5 series comprises twenty-seven lathes, requiring a 35 h.p. motor.

4.5 Shell Equipment

In what follows there is described the operation of a 4.5 shell plant and the construction of the machines which Messrs. Turner supply. In such a plant there are twenty-seven lathes of four distinct types, and these (a) boring; (b) turning; (c) four types may be classified as thread-milling; and (d) wave-grooving machines. Figs. 1 to 4 represent the general construction of the four classes. It will be noticed that in many respects the boring and turning machines are similar, as are the thread-milling and wave-grooving machines. Such similarity naturally facilitates the rapid manufacture of the machines themselves.

Boring and Turning Lathes

The boring lathe, bed and headstock are combined in one iron casting. A large stepped hollow spindle provided with a ball thrust bearing sits within the headstock, and at the left hand end this has keyed to it a spur wheel. This wheel meshes with a pinion on a belt-driven countershaft fixed to the back of the lathe bed. The feed is derived from the spindle by chain and sprocket wheel, and is transmitted through a pair of gear wheels on to the feed shaft along the front of the bed. A dog clutch and hand wheel on this shaft permit the power feed to be interrupted and a hand feed applied. On the end of the feed shaft a dropping worm operated by a trip lever is keyed. This gears yith a worm wheel on a cross shaft carried in a pair of fixed bearings in the bed casting. A pinion on this shaft meshes with a central rack on the under side of the boring bar saddle. A star handle for rapid traverse of the saddle is provided on the cross shaft. Half the bearing for the bar end is formed in the saddle casting proper and the other half in a cap hinged to the saddle casting along its rear edge and pulled up by a bolt at front.

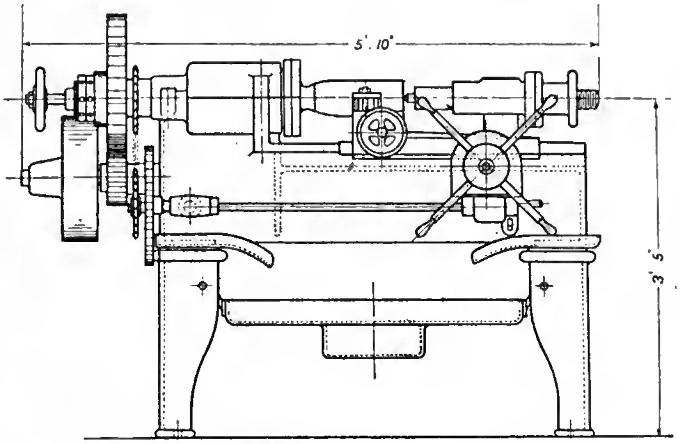


FIG. 2. TURNING LATHE FOR 4.5 IN. SHELLS.

The turning lathe, as will be seen from Fig. 2, is of very similar design to the above. It is modified in so far that the saddle is provided with a hand-fed cross-slide, while an overhung tailstock for the back centre is bolted to the rear face of the bed.

Thread-Milling Machine

The thread-milling machine, Fig. 3, is of radically different design. In this tool the work is fixed inside the hollow spindle of the headstock. This spindle is driven through a worm wheel, a dropping worm and a pair of bevel wheels from a pulley shaft at the back of the bed. The cutter is rotated by a separate belt drive from the overhead counter-shaft, and is mounted on a cross-slide carriage, which gives facilities for racking the cutter into position longitudinally and feeding it into the work to an indexed depth.

With the worm dropped so that the work is stationary, the cutter is racked longitudinally to a thread short of the full length to be threaded. It is then set rotating, and is fed into the metal to the indexed depth. There are thus cut in the metal a series of short parallel grooves, each of which will become the start of a separate thread. The work being started up, its speed of rotation is slow, and during its rotation it is slowly fed forward. Its total feed only amounts to one pitch of the thread being cut and its total rotation to one complete revolution. At the end of this mo-

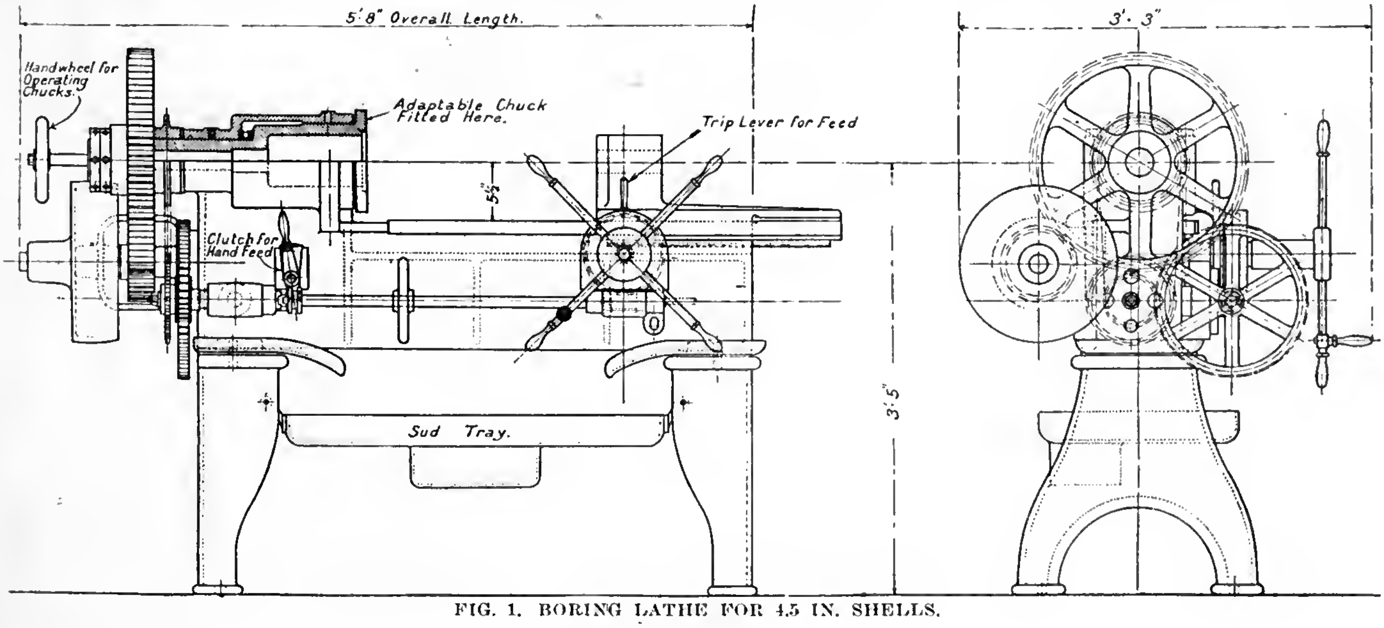


FIG. 1. BORING LATHE FOR 4.5 IN. SHELLS.

tion all the short parallel grooves have been extended round the circumference of the work and have been joined up into a continuous thread. The worm can now be dropped so as to stop the work. The cutter, until it is stopped, will not damage the thread, for it is rotating at that point of the circumference of the work at which it started.

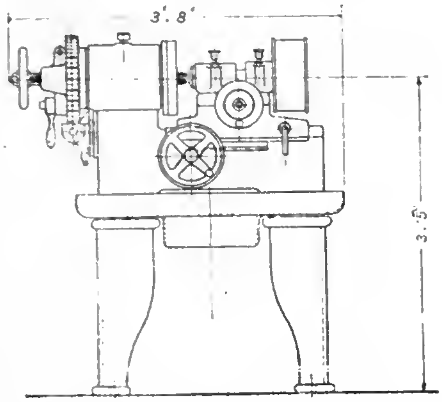


FIG. 3. THREAD MILLING MACHINE.

The advance of the work is obtained by the provision of a thread on the headstock spindle and of a fixed nut for this thread to work in. At the end of a job the headstock spindle can be readily moved back through the small distance it has advanced by dropping the worm and rotating the spindle backwards through one revolution. As the feed does not amount to more than say 1-16 in. the forward movement of the spindle does not upset the drive between the worm and the worm wheel.

The wave-grooving machine—Fig. 4—is somewhat similar to the thread-miller in general appearance. Its spindle, however, is driven directly by belt, while the cross-slide of the saddle carries a four-

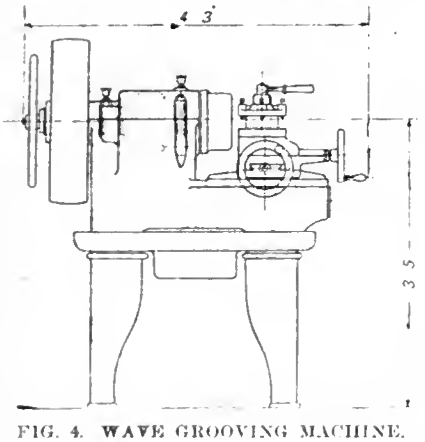


FIG. 4. WAVE GROOVING MACHINE.

tool turret. The tools on the turret are employed to undercut the edges of the groove for the copper driving band and to "wave" the bottom. When waving is being performed the headstock spindle, within which is the shell, is made to reciprocate in the required manner by means of a cam arrangement.

These four types of machine are used to perform all the cutting operations required on the shell body and the nose piece. Each distinct operation is performed on a separate machine, which is kept constantly set for that operation. Some of the operations absorb more time than others. For these the machines are duplicated or triplicated. Although the machines are divisible into four classes, the members of each class are not in general identical. The feat-

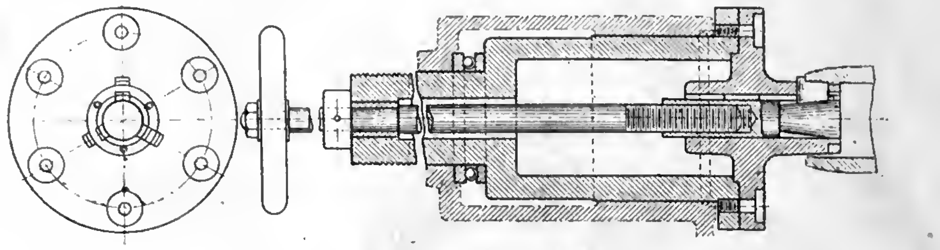


FIG. 6. CHUCK FOR TURNING.

ure of difference is the method adopted of holding the work in the machine. This method is in each case designed with a view to the stage which the work has reached and to the nature of the operation next to be performed on it.

Fig. 5 gives a "program of operations," showing the stages through which the shell and the nose piece pass, and indicating the manner in which the work is held in the lathe in each. The first two operations on the shell body are performed on machines of the turning lathe type. There is one machine for each operation. These latter, are first, cutting off the excess material at the closed end of the rough shell forging, and, secondly, cutting off the excess material at the open end to a gauged length. The third operation, that of forming the "centre" on the closed end, is performed on a 20 in. upright drilling machine. This tool is not supplied by Messrs. Turner, and is not counted in the total of twenty-seven required for the whole plant.

The fourth operation is the rough turning of the shell body. For this three machines of the turning lathe class are provided. The movement of the tool during this operation is controlled by a curved templet, against which a roller on the cross-slide is made to bear. In this way the open end is given an approach to its final curved taper form. The manner in which the work is held during this operation is illustrated in Fig. 6. To the end of the hollow headstock spindle a plate is bolted, through the boss of which there can slide on a key a short cylinder, one end of which is bored and tapped, while the other end is turned as a reversed cone. The tapped portion screws over the threaded end of a pull-up rod which, passing out at the left-hand end of the hollow spindle, is provided with a hand wheel. Three slots are cut radially through the boss surrounding the conical portion of the keyed cylinder, and within each of these a stepped gripping plate is placed. These plates, on the hand wheel being turned, are forced out by the cone against the bore of the shell mouth, and with the back centre establish a complete support for the shell. The gripping plates, on the removal of a finished shell, are held in place by means of a ring fixed to the nose of the boss.

The fifth operation is in three parts, namely, roughing the bore, roughing the bottom, and finishing the bore. To each of these sections two machines of the boring lathe class are allocated. The method of holding the shell in this case is illustrated in Fig. 7. A rod, as before, passes through the hollow spindle, but it does not go beyond the step in this spindle. Here it is threaded into a nut, while a "centre" is let into its end.

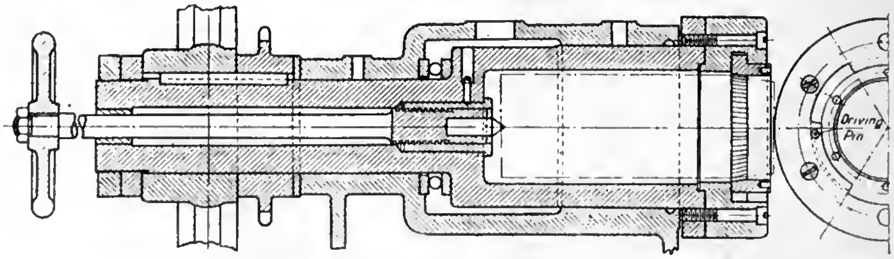


FIG. 7. CHUCK FOR BORING.

The shell, open end out, is inserted within the hollow spindle, and over its nose there is passed a collar, the bore of which is slightly conical and roughened. An outwardly extending flange on this collar is cut down over three alternating sectors. The three projecting pieces of flange thus left can be passed through three corresponding openings in a member bolted to the spindle end.

The collar is now turned through about 60 deg., so that it is held against translational movement by its three lugs.

The radial face of one of these lugs is caused to bear against a pin fixed across its passage in the bolted member, so that the reaction of the cut will not rotate the work relatively to the hollow spindle. With the collar thus fixed the nose of the work is tightened within the bore of the collar by screwing up the centre rod.

Operation six is to mill the thread for the reception of the nose piece. One machine of the thread-milling class is provided for this work. The method of holding the work is quite clearly shown in Fig. 5. The right-hand end of the hollow spindle is provided with a fixed plate bored conically to suit the taper on the shell nose. The shell is inserted from the left-hand end, the opening here being afterwards closed by a hinged breech-block, through which a "centre" is screwed. As shown in Fig. 5, a catch is provided to engage the teeth of the spur wheel on the hollow spindle. This pawl is thrown in when the thread is being started to prevent the work from rotating.

For operation seven — finishing the turned surface—two machines of the turning lathe class are provided, and for operation eight—cutting the closed end to length and forming the groove for the copper driving band—one such machine is installed. The method of holding the work in both cases is to screw the threaded nose of the shell over an easy-threaded arbor on the pull-up rod and to support the other end of the shell on the back centre.

One machine of the wave-grooving class is used for the ninth operation, which consists of waving and undercutting the groove formed in operation eight. The work is held in the hollow spindle by means of a collet chuck, which can be pulled up by an external hand wheel.

Operations ten and eleven are concerned with the roughing and finishing of the recess on the closed end of the shell. One machine of the lathe class is employed for each. The nose of the shell is held within a tapered bush inserted into the hollow spindle. The parallel body part of the shell is embraced by a cap, which is bolted to a suitable member attached to the mouth of the hollow spindle. Between the cap and the chuck member springs are inserted, so that half a turn of the bolt nuts applies or releases the pressure of the cap on the shell.

For operations twelve and thirteen, machines and appliances not supplied by Messrs. Turner are required. The former operation consists of inserting the base plate into the recess and riveting it therein by means of a pneumatic hammer. The latter operation covers the pressing on the copper driving band and its compression into the waved groove. Various methods of pressing on the copper band of a shell have been devised. In the illustration, a hydraulic one is indicated, the apparatus consisting of a hydraulic cylinder and four dies connected to toggle links so as to act simultaneously on the copper band when the ram of the cylinder is elevated.

A modified machine of the wave-grooving type is used for operations fourteen and fifteen. These operations consist of turning the exterior of the copper band to the correct form and of facing off the riveted-in base. One machine is employed for these two operations. The shell is gripped as in operation nine by means of a collet chuck, and the machine is otherwise identical in design with the wave-grooving and undercutting lathe except that the cam arrangement for reciprocating the work is not required.

The nose piece is now screwed on to the shell, when the whole is ready for the sixteenth and last operation. This consists of chamfering the edge of the fuse hole in the nose and of finishing the external form of the nose piece to the required curve and blending this curve into the curvature of the nose end of the shell body. One machine of the boring type is employed on this operation. The shell is held in the hollow spindle by means almost identical with those used in operation five. The chamfering and blending operations are conducted simultaneously. The chamfering is performed by a countersink tool held in the boring bar support. The blending is conducted with a tool in the form of a plate ground to the required curvature and carried in an L-shaped bracket, which is fixed to the boring bar support. — The Engineer.

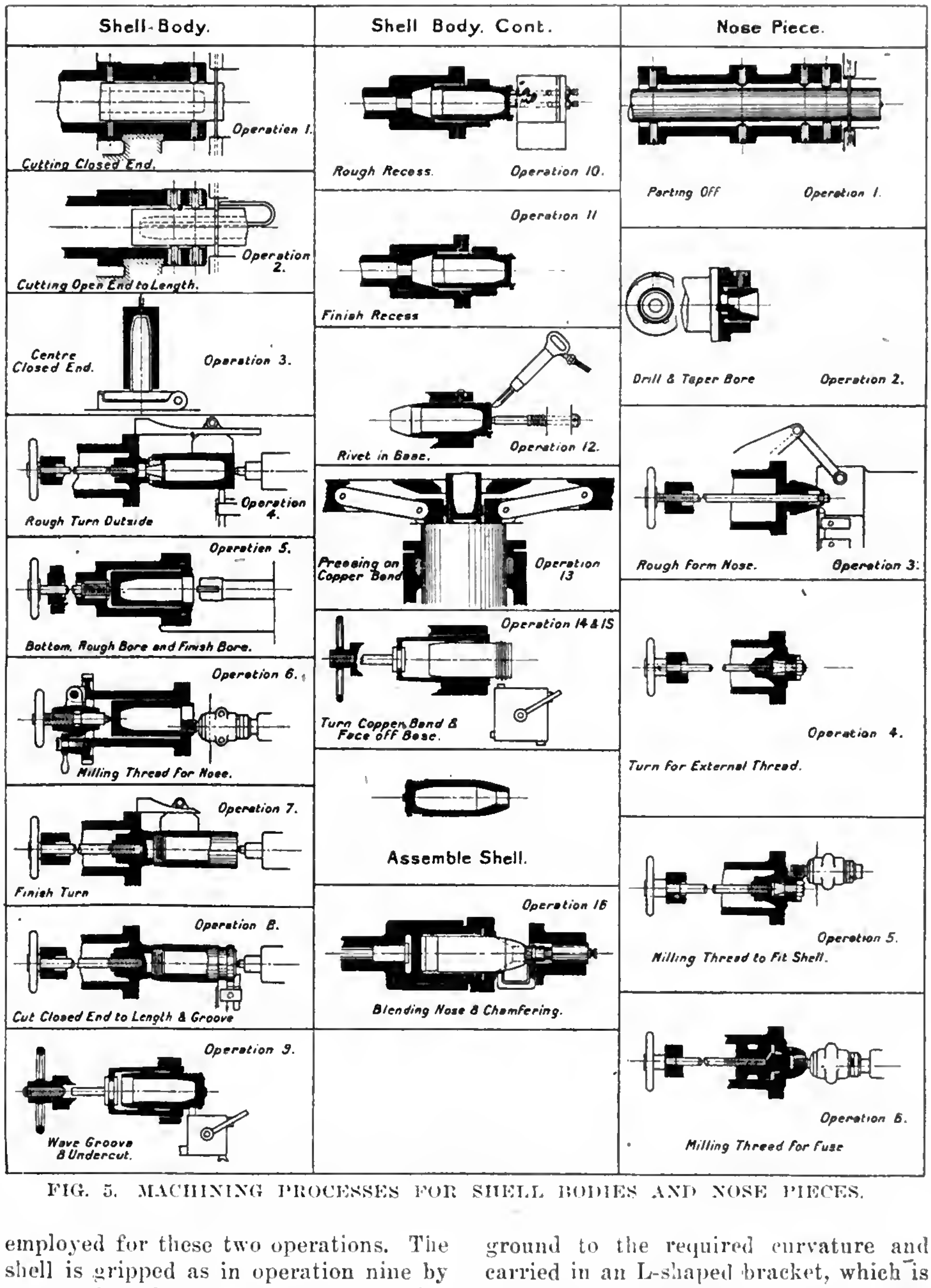


FIG. 5. MACHINING PROCESSES FOR SHELL BODIES AND NOSE PIECES.

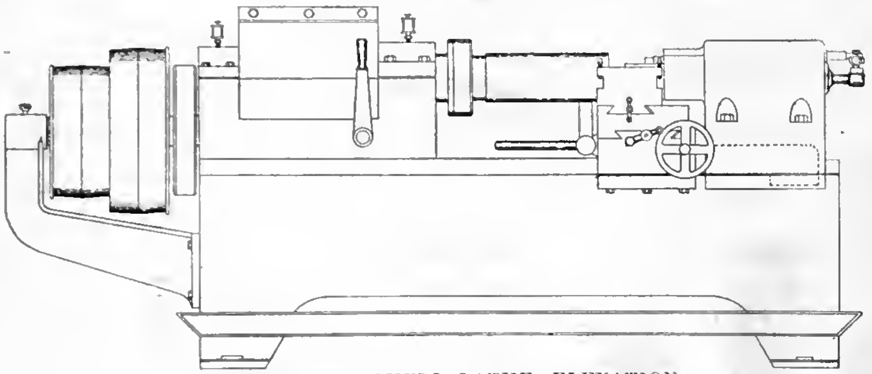
Welland, Ont.—A deputation from Stamford town and township councils will ask the Dominion Government to construct a navigable canal and turning basin at a point near Lundy's Lane, connecting with the Welland Ship Canal.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

THREE-SPINDLE SHELL LATHE

THE accompanying drawings illustrate a three-spindle shell turning lathe which has been developed by the Montreal Foundry & Machine Co., Montreal, with the object of facilitating rapid construction combined with maximum production capacity. Every effort has been made to obtain ample rigidity, ease of manipulation and rapidity of production on shells up to 6 in. diameter. This machine has a height of 40 in. from the floor to the centre of spindle, a length of 10 ft. 6 in. and a width of 48 in., with an approximate weight of 14,000 lbs.



THREE-SPINDLE SHELL LATHE—ELEVATION.

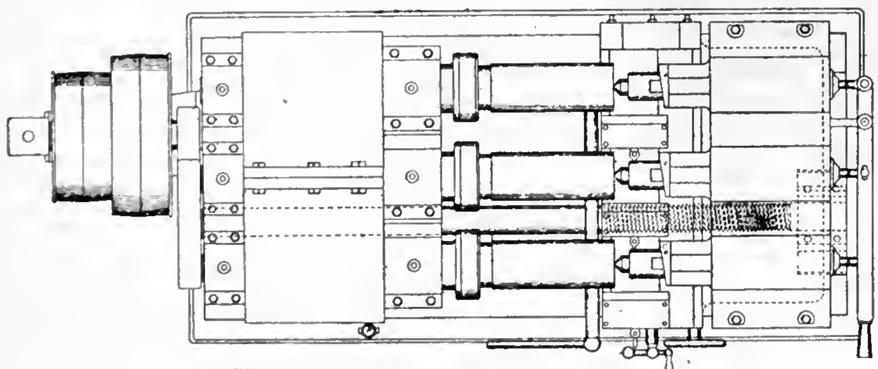
Four changes of spindle speed are provided, two from the counter shaft and two from the cone pulleys on the lathe. The three spindles are positively driven through a train of triple, semi-steel gearing: no idlers or frictions being used in the forward motion of the saddle. The return motion of the saddle, however, is accomplished by means of a friction clutch, located on the lead screw, below the headstock of the lathe. This clutch is operated by the lever, shown in front of the headstock. This lever also operates the quick change feeds. The arrangement of the mechanism is such that the change from one feed to another can be obtained while the lathe is in operation.

The drive is so arranged that the pulleys can be made to carry any width of belt suitable to the work for which the machine is constructed, the bracket being designed to suit the drive, which allows ample leeway for additional power. These machines can also be equipped with motor drive if required.

The main bearings for the spindle are made of bronze, with lengths of $7\frac{1}{2}$ and $5\frac{1}{2}$ inches, and diameters of $4\frac{3}{4}$ and $4\frac{1}{4}$ inches, for front and rear respectively. Each spindle is fitted with a special expanding driving chuck, which operates on the bore of the shell.

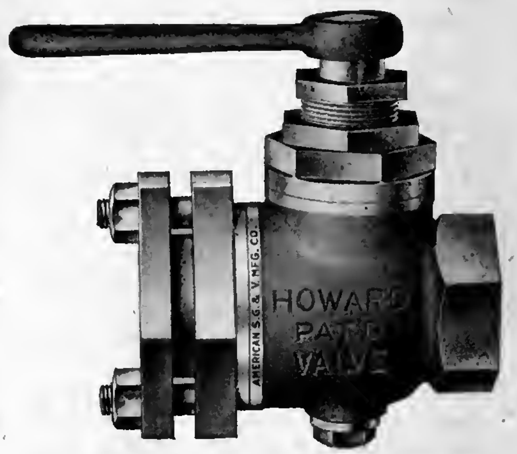
The tail stock is arranged so that the three centres can be operated rapidly and simultaneously, the design allowing for a variation of about $\frac{1}{4}$ inch in length in the work.

The carriage is of heavy design with a bearing length of 32 in., the front support so designed that the resultant thrust of the three operating tools comes at right angles to the direction of the thrust, thus reducing to a minimum any possibility of the saddle lifting. The carriage travel is obtained from the heavy coarse pitch buttress thread, lead screw L, located between the shears of the lathe and in a position as near as possible to the centre of the load, insuring a steady drive, and eliminating any undue strain upon the apron gearing.



THREE-SPINDLE SHELL LATHE—PLAN.

The driving nut is placed at the rear of the carriage, which prevents any cuttings falling on the lead screw thread. For traverse feeding by hand, the carriage is operated by means of the hand wheel which is connected by shafts and bevel gearing to the lead screw nut. The three tool posts can be adjusted separately to depth of cut, and operated simultaneously. If, at any time, it is necessary, through soft tools, hard shells, or other causes, a particular tool can be drawn back without stopping the whole machine, thus preventing unnecessary loss. Each tool post is of duplex type, or if desired any number of tools may be employed.



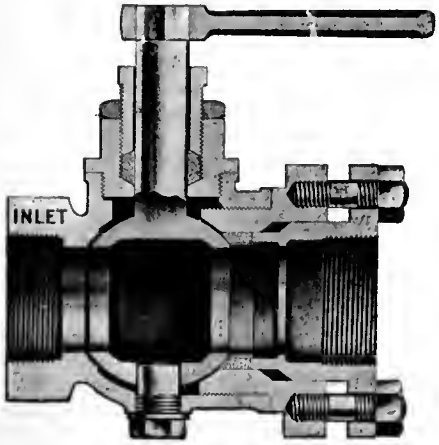
EXTERIOR VIEW OF BALL BLOW-OFF VALVE

IMPROVED BALL BLOW-OFF VALVE

AN improved Howard ball blow-off valve is shown in the accompanying cuts, being now manufactured by the American Steam Gauge & Valve Mfg. Co., Boston who have recently taken over its production and sale from the Howard Iron Works.

In its improved form the valve is provided with a one-piece ball and stem which completely overcomes former trouble with inserted stems becoming detached from the ball valve. Another improvement is the addition of a guide pin at the lower side of valve which retains the valve in position against the Bakelite packing. This maintains the stem in correct alignment with the stuffing box, while the packing material now

adopted possesses peculiar properties in regard to the surface of the ball, which keep the bearing surface smooth, polished, and in a state of maximum efficiency with little or no wear. A lock nut is also



SECTIONAL VIEW OF VALVE SHOWING IMPROVED CONSTRUCTION

provided to prevent unintentional slackening of the stuffing box gland on the valve stem during use.

THE TOOL-ROOM AND ITS EQUIPMENT

THE necessity for the establishment of a separate tool room as an adjunct to the machine shop is not always apparent, but all who are familiar with the methods of production demanded by modern conditions know that the tool room is an important unit in any manufacturing scheme, and that on its efficiency the profitable running of a plant is to a large extent dependent.

If the plant is composed purely of general purpose machines, such as engine lathes, drilling machines, planers, shapers, and slotters, the small tools and accessories which are required will consist almost entirely of standard articles like drills, taps, and reamers. These can be bought out, and, if supplemented by the necessary quantity of ordinary tools made by the blacksmith, will enable such a plant to be run with a fair measure of success.

A small tool equipment of this kind requires only to be kept in good working order and to be added to as occasion demands. In such cases, therefore, the work of the tool room is confined to storing the various small tools and accessories which are used in the machine shop, sharpening twist drills, cutting tools, etc., and attending to their distribution and collection.

It is obvious that work of this kind cannot be done properly unless a separate department—a tool stores rather than a tool room—is provided where it may be carried on without interference. In addition to the necessary storage racks and shelves the department should be equipped with the various machines—twist drill grinder, and wet tool grinder—which are used for maintaining the different cutting tools in good condition.

A machine shop as above described, in which the plant consists of general purpose machines, and provided with a tool store, may be quite efficient for repair or experimental work, but cannot undertake any real manufacturing with much hope of success when called upon to compete with others possessing a more suitable equipment.

To-day, every engineering establishment which aspires to be something more than an experimental or repair shop, includes in its plant a certain number of labour saving machines such as capstan and turret lathes, milling machines, and automatic screw machines. Machines of this kind cannot be run efficiently unless facilities are provided for supplying the special tools, jigs, and fixtures which they use. It is therefore essential that a tool room should be installed, having the plant necessary for the actual production of these articles, in addition to the accommodation and machinery which is required for their storage and maintenance.

Tool Room a Manufacturing Necessity

It may be argued that, provided plenty of spare cutters are ordered with the machines, a tool room, as distinct from a tool store, can be dispensed with; this assumption always proves to be a fallacy however attractive it may be to those who have to provide the money for purchasing plant. It frequently happens that, when machines are supplied, equipped with special tools for certain work, cutter breakages occur, due to careless handling, after they have been started up. The cutters are generally special so that the makers can hardly be expected to furnish replacements as quickly as the customer would like. The result is that, if the customer has no facilities for making the cutters himself, the machines stand idle, which is an unsatisfactory state of affairs for all concerned. Had the customer possessed a tool room the cutters could probably have been replaced without delay. The possibility of having high productive machines rendered unproductive or inefficient through lack of proper tools is in itself sufficient argument in favour of the provision of a tool room, which should be made one of the first considerations instead of the last. It is always advisable to be independent of outside supplies for, however carefully the probable demand is estimated and provided for, an unexpected sequence of accidents may cause some particular cutter to run out to stock.

Equipment Feature

We may now proceed to enumerate the machines with which a tool room should b equipped. It will be obvious that no hard and fast rules can be laid down, as the ideal equipment of a tool room cannot be the same in every case, but will be influenced by the character of the plant for which it has to cater. The entire subject is treated in an elementary manner, as will be noted, the intention being to offer suggestions to those who have not yet installed a tool room.

A convenient method of dealing with the question of what machines to instal will be to draw up a list of those which may be looked upon as essentials, indicating, in the less obvious cases, the kind of work on which they would be

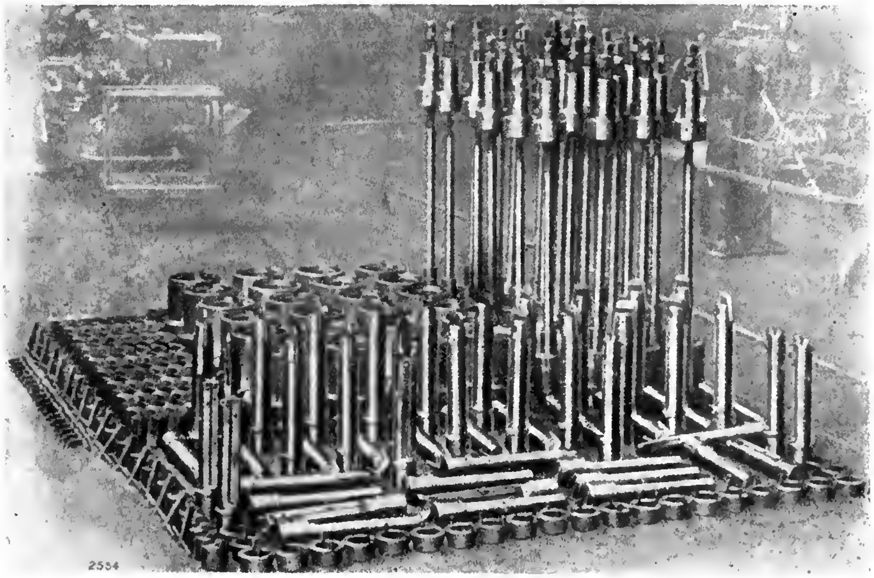


FIG. 1. SPECIAL TOOLS AND CHUCKS FOR BORING 60-PDR. HIGH EXPLOSIVE SHELLS ON ALFRED HERBERT NO. 3 HEXAGONT TURRET LATHES.

employed. The list is by no means exhaustive, but forms a nucleus which may be added to and modified as conditions demand.

1—A power hack saw for cutting off high speed steel bars. High speed steel is too expensive to permit the employment of any method of cutting off which involves the use of a wide cutter. Mild steel pieces may be requisitioned from the general cutting off department.

2.—A tool room lathe, say 7-in. centres, fitted with draw-in chuck, three-jaw and four-jaw chucks, taper attachment: a metric thread cutting attachment is also often very useful. This machine is used for making taps, dies, gauges, form-relieved milling cutters, and for all accurate turning.

4.—A gap lathe of good sturdy design about 9 in. centres, for rough turning boring bars, tool holders and milling boring bars, tool holders and milling cutters; also for occasional jobs requiring the large swing provided by the gap.

5.—A precision bench lathe with the usual attachments, including screw cutting; used for making small taps, dies and gauges.

6.—A universal milling machine, say 20-in. x 7-in. x 18-in. having automatic feeds in all directions, vertical milling attachment, and slotting attachment; for fluting milling cutters, reamers, special drills, cutting slots and keyways, and jig boring.

7.—A 6-in. slotting machine with circular table. If this machine is installed, the slotting attachment under item 6 can be omitted.

8.—A two spindle ball bearing drilling small machine with one geared spindle for drilling small holes, counterboring and facing.

9.—A heavy upright drilling machine, say 25-in. swing, with compound table; for large jig work.

10.—An 18-in. double geared shaper for roughing out form tools, tool holders and cutter blades.

11.—A 12-in. x 36-in. Universal grinding machine for all external and internal cylindrical work.

12.—A universal tool and cutter grinded with full complement of attachments, with the exception of those for external and internal grinding which are covered by Item 11.

13.—A surface grinder, for form tools, boring cutters and gauges; not perhaps required unless a large amount of surface grinding has to be done; otherwise this work is covered by Item 12.

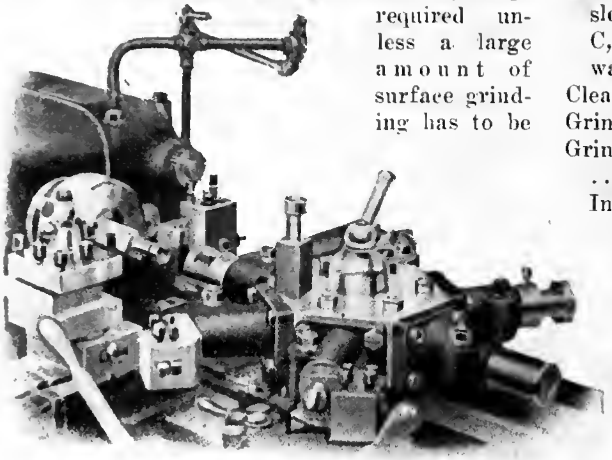


FIG. 2. TYPICAL OUTFIT OF CAPSTAN LATHE TOOLS.

14.—An oscillating tool grinder for making all kinds of lathe, planer, and shaper tools; also for roughing out form tools.

15.—A wet tool grinder for sharpening lathe tools and similar work.

16.—A twist drill grinder.

17.—A marking out table.

18.—An arbor press.

19.—A hardening furnace for high speed steel. This may, in some cases, be more conveniently placed with other furnaces in the general hardening department

It will be noted that no mention has been made of measuring machines, reference discs for checking gauges, and other precision tools of the like nature. If the character of the work done in the main shop necessitates the employment of such tools they must be included in the tool room equipment.

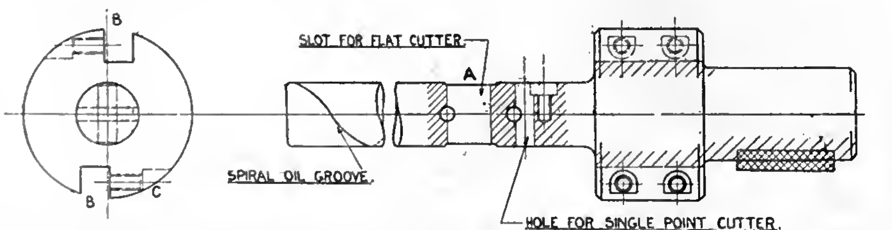


FIG. 3. BORING BAR FOR USE ON A CAPSTAN LATHE, HAVING SLOTS IN THE COLLAR FOR CARRYING TWO CUTTERS FOR COUNTERBORING OR END FACING

To show the utility of the machines included in the list, we will assume that the boring bar shown in Fig. 3 has to be made. The following is an outline of the operations, although not necessarily in the correct sequence, which would be required in producing this typical capstan lathe tool.

Operation.	**Machine Used**
Cut-off to length	Not in tool room
Centre the two ends	Item 2
Rough turn	Item 4
Mark out	Item 17
Drill and tap	Item 8
Mill slot A, flats on sides of slot A, slots B, counterbores C, spiral oil groove, and keyway	Item 6
Clean out corners of slot A	Item 7 or 6
Grind to finished size	Item 11
Grind flats on sides of slot A	Item 12 or 13

Indirectly, Items 15, 16, 18 and 19, are also used, thus bringing over 60 per cent. of the plant into operation on one piece of work. The remainder of the machines would nearly all be brought into use in providing the cutting tools. The list of machines given may at first sight seem a formidable one to those who are thinking of starting a tool room, but an examination will show that a large number of them are standard machine tools.

It does not follow that because a tool room is available it is advisable to make in it all the tools which are required by the shop; it is frequently more economical to buy the majority of these from firms who specialise in their manufacture. Standard twist drills, taps, reamers, and box tools must obviously be purchased from outside, leaving the tool room free to deal with special tools, jigs, and fixtures. Work of this kind should be brought into the proper department instead of being allowed to drift through the works impeding the regular output. If there happen to be, on large jigs or fixtures, some operation —planing for instance—which is outside the possibilities of the tool room plant, the machine shop may then come to the rescue; this should, however, be as far as possible avoided.

Whether a special drawing office staff is required depends entirely on the amount of tool work and on its character. Where replacements only have to be dealt with or new tools of a simple nature, all the necessary designing can in most cases be left to the foreman tool maker. Where new layouts of tools have to be made for the more complicated work of automatic screw machines and the like, a draughtsman is essential, for clearances are frequently cut fine, and alterations found necessary by trial are expensive to rectify.—Herberts' Monthly.

B. E. Barnhill, for many years divisional engineer on the Algoma Eastern Railway, has been appointed to a similar position with the Algoma Steel Corporation, Sault Ste. Marie, Ont.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. MAY 18, 1916 No. 20

THE INTERCHANGE OF DATA

THE subject of industrial research is receiving very considerable attention as a result of its influence on the development of the manufacture of certain products of vital importance to various branches of industry in different parts of the world.

That the co-ordination of effort in this direction is desirable from a national point of view goes without saying, but in all of the schemes and proposals now being advanced, and efforts being made, to give the subject due attention, a point arises, regarding which all future developments of the subject will take issue as being for or against.

The general impression of the man in the street seems to be that the results to be obtained by industrial research as a feature of future manufacturing activity will be a sort of panacea for our past troubles, and a reinforcement of our future efforts to maintain our position amongst the producing nations of the world. References are frequently made to the subject in a broad, sweeping manner, but always with a vagueness indicative of the wish being father to the thought, rather than being based on definite knowledge and experience.

As a matter of fact there is little or no mystery in the situation whatever. The lines along which industrial research must be carried on will be decided by manufacturers themselves, for however generously inclined a Government or administrative body might wish to be, it cannot be doubted but that little advantage is to be gained by publishing results broadcast to the world. The element of secrecy has been and always will be to some extent a factor in many industries which are not purely mechanical. Machinists' activities are always disclosed by results. Every piece of apparatus, equipment, jigs, tools, measuring instruments and methods are each the result of known principles, based on fixed mechanical laws, the value of which varies, however, with the ingenuity of application. They are concrete in form, and their action is visible to, and capable of comprehension by comparatively untrained minds. Just as soon, however, as the problem reaches phases which do not involve the use of mechanical appliances, and enters the regions of electricity, thermodynamics and chemistry, the field for research broadens out instantly.

The science of the conversion of heat into mechanical energy is equally well developed and understood in most countries; the broad principles of chemistry are being more widely known every year, and electricity is almost commonplace in its applications, yet it is not to the multitudes engaged in making or using these things that the world is indebted, although it more frequently rewards them.

The men to whom the world is indebted are the engine designer, naval architect, chemical manufacturer, metal producer—in a word, the men who perceive the applications of abstract knowledge to concrete results, who place processes and materials at the disposal of the engineer whereby work may be done for the benefit of mankind—more of it, better and cheaper.

The results of industrial research are the well from which civilization has sprung and while the humble machinist in performing his daily labor is a necessary factor in the distribution of such results, it does not follow that widespread research would benefit him individually. The full value of research is in its influence on one or other particular industry and under present conditions, limits those influences to certain countries. The day of broadcast industrial knowledge is still far distant. An exemplification of this is evidenced by the attitude of British engineers relative to the interchanges of data and ideas regarding the development of the Diesel engine, a peculiar reluctance to enter any discussion whatsoever of the subject being recently displayed by men who are known to be in possession of information regarding the design of this type of prime mover, the growing importance of which is commanding attention from engineers of all nationalities.

We feel, however, that circumstances, past and present, justify a closer surveillance of technical knowledge of this nature, and confidence in our manufacturers throughout the Empire at this time may well be worth while in anticipation of the advances that will materialize at a later date and concerning which we little reckon at the present moment.

CANADIAN SHIPBUILDING

THE launch of the icebreaker "J. D. Hazen," on May 15, from the yard of Canadian Vickers, Montreal, marks a new era in the development of shipbuilding and marine engineering within the confines of the Dominion of Canada. The event, as was to be expected, created unusual interest among citizens of all classes in our Canadian Metropolis, although to the commercial and manufacturing community the import of the occasion carried an even deeper significance.

Following closely on the eloquent plea made a few weeks ago by Col. Cantley, president of the Nova Scotia Steel & Coal Co., for systematic and effective Government recognition of the Canadian shipbuilding industry, particularly on our ocean waterways and ocean shores, and being graced by the presence of many members of the Federal Cabinet, including the Prime Minister, there is little doubt but that the above function will give the additional and perhaps just the remaining stimulus necessary to put steel shipbuilding on a basis whereby it may both meantime meet competition from outside, and ultimately become self-supporting as has our steel industry.

Canadian Vickers, in their administrative, management and constructional organizations are to be congratulated on the achievement of building the "J. D. Hazen," and we may be pardoned for prophesying that each succeeding year will see others like her, together with those of a more strictly commercial type maintain and enhance the now established reputation.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 70	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	

	Montreal	Toronto
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Victoria, No. 1	$27 00	$25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents
Common bar iron, f.o.b., Toronto	3.00
Steel bars, f.o.b., Toronto	3.00
Steel bars, 2 in. and larger, base	5.25
Common bar iron, f.o.b., Montreal	3.00
Steel bars, f.o.b., Montreal	3.00
Twisted reinforcing bars	3.25
Bessemer rails, heavy, at mill	2.50
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	
F.O.B., Toronto Warehouse.	**Cents**
Steel bars	3.00
Small shapes	3.50
F.O.B. Chicago Warehouse	**Cents**
Steel bars	3.10
Brass, 2 in. and up	4.00
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper, carload	$33 00	$32 00
Electrolytic copper	32 50	31 75
Castings, copper	31 00	31 50
Tin	49 00	54 00
Spelter	21 50	21 00
Lead	9 25	9 50
Antimony	44 00	45 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in.	$4 00	$4 00
Heads	4 25	4 25
Tank plates, 3-16 in.	4 30	4 50

WROUGHT IRON PIPE

Prices in effect April 26, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 06	5 31
1/2 in.	3 91	6 08
3/4 in.	4 72	7 65
1 in.	6 97	11 31
1 1/4 in.	9 43	15 30
1 1/2 in.	11 28	18 29
2 in.	15 17	24 61
2 1/2 in.	23 99	38 90
3 in.	31 37	50 87
3 1/2 in.	37 72	61 18
4 in.	44 69	72 49

Lapweld

	Black	Galv.
2 in.	$17 02	$26 46
2 1/2 in.	25 16	40 07
3 in.	32 90	52 40
3 1/2 in.	39 56	63 02
4 in.	46 87	74 67
4 1/2 in.	57 15	90 81
5 in.	66 60	105 82
6 in.	86 40	137 28
7 in.	116 62	179 70
8 in. x 25 lbs. per ft.	122 50	188 75
8 in. x 25 lbs. per ft.	141 12	217 44
9 in.	169 05	260 48
10 in. x 32 lbs. per ft.	156 80	241 60
10 in. x 40 lbs. per ft.	201 88	311 06

List for Ontario, Quebec and Maritime Provinces

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 00	$18 25
Copper, crucible	21 50	21 50
Copper, heavy	21 75	22 00
Copper wire	21 75	22 00
No. 1 machine compos'n.	17 00	17 00
No. 1 compos'n turnings	14 75	15 00
New brass clippings	16 25	15 00
No. 1 brass turnings	12 00	12 00
Heavy melting steel	9 00	10 00
Boiler plate	11 75	10 50
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	11 50	10 00
Stove plate	10 50	10 50
No. 1 machin'y cast iron	14 75	14 50
Heavy lead	7 00	7 25
Tea lead	6 25	6 25
Scrap zinc	14 50	14 00
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	50
Stove bolts	62 1/2
Plate washers	25
Machine bolts, 3/8 and less	40
Machine bolts, 7-16 and over	30
Blank bolts	30
Bolt ends	30
Machine screws, flat head, iron	06 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in.	$3.75 per lb. off
Nuts hex., over 1 in.	$2.00 per lb. off
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	37 1/2
Boiler rivets, base, 3/4-in. and larger	$4.85
Structural rivets, as above	4.75
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS

	Per Cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	50
Finished Nuts over 1 in.	37 1/2
Semi-Fin. Nuts up to 1 in.	50
Semi-Fin. Nuts over 1 in.	37 1/2
Studs	45
Taper pins	.65
Coupling bolts	net
Planer head bolts, without fillet	.15
Planer head bolts, with fillet	net
Planer head bolt nuts up to 1 in.	.60
Planer head bolt nuts, over 1 in.	.55
Planer bolt washers	list plus 10
Hollow set screws	list plus .20
Collar screws	list plus.20
Thumb screws	.20
Thumb nuts	.75

BILLETS.

	Per gross ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh.	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES.

Standard steel wire nails, base	3 70	3 65
Cut nails	3 40	3 40
Miscellaneous wire nails		65%
Pressed spikes, 5/8 diam., 100 lbs.		3 90

MISCELLANEOUS

Solder, guaranteed	0.31
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	2.85
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.18
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls., gal.	0.70
Linseed oil, raw, single bbls.	0.89
Linseed oil, boiled, single bbls.	0.92
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Packing, square headed	0.25
Packing, No. 1 Italian	0.30
Packing, No. 2, Italian	0.23
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½

POLISHING DRILL ROD

Discount off list, Montreal and Toronto	25%

CARBON DRILLS AND REAMERS

	Per Cent.
Standard drills to 1½ in.	45
Standard drills over 1½ in.	5
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	net
Bit stock	55
Ratchet drills	net
Machine bits for wood	15
S.S. drills for wood	45
Wood boring brace drills	25
Electricians	20
Sockets	30
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks ....list plus	5
Bridge reamers	55
Centre reamers	net
Chucking reamers	net
Hand reamers	5

High-speed drills up to 1½ in. and over 1½ in. Double list plus 20 per cent.

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60 per cent.; headers, 60; flanged unions, 55; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$4 15	$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 25
Canada Plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	7 00	7 00
Premier, 10¾ oz.	7 25	7 25

PROOF COIL CHAIN.

¼ in.	$8.35
5-16 in.	7.35
3/8 in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
5/8 in.	6.35
¾ in.	6.15
7/8 in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B B

1/8 in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
3/8 in.	6.35
7-16 in.	6.35
½ in.	6.35
5/8 in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	60-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	.....
1¼ in.	19 55	.....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	13 00
2¼ in.	26 60	15 45
2½ in.	29 00	17 20
3 in.	38 70	20 00
3½ in.	44 00	24 00
4 in.	49 50	30 60

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands

	Per 100 lbs.
Galvanized, 24 wires, 3/8 in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, 3/8 in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	40%
Standard	40 & 10%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto

WASTE

WHITE	Cents per lb.
XXX Extra	.16
Peerless	.16
Grand	.15
Superior	.15
X L C R	.14
Atlas	.14
X Empire	.13
Ideal	.13
X press	.12
COLORED	
Lion	.10¼
Standard	.9¼
No. 1	.9¼
Popular	.8¼
Keen	.7¼

WOOL PACKING

Arrow	
Axle	Prices on
Anvil	application
Anchor	

WASHED WIPERS

Select White	
Mixed colored	Prices on
Dark Colored	application

This list subject to trade discount for quantity

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.37 to .39
Tin	.58 to .60
Zinc	.26 to .28

Prices Per Lb.

COPPER SHEETS

	Montreal	Toronto
Bars. ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 in.	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

BRASS

Brass rods. base ½ in. to 1 in. rd.	0.55
Brass sheets. 8 in wide 20 oz.	0.60
Brass tubing. seamless	0.55
Copper tubing. seamless	0.55

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

RUBBER BELTING

Standard	50%
Best grades	30%

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy	.35
Copper sulphate	.24
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, May 15, 1916.—The scarcity of labor continues to be a serious question, and this will become more pronounced as the good weather approaches. The carters' strike has been settled, the men accepting an increase of 10 cents per day. This will result in some relief to the freight situation, as the various roads were compelled to place a temporary embargo on goods coming to Montreal.

Pig Iron

Little can be said regarding the pig iron situation, with the exception that foundry iron is very quiet, and the capacity of the furnaces is being taxed to supply the requirements of the steel-making industries.

Steel

Inquiry and demand for shell steel, both for home and export, continues very heavy, and the fact that much of this supply is to be delivered before the end of the year indicates that the capacity of some of the mills must be very elastic, as it was generally supposed that this year's output of many of these large mills had been booked months ago.

Few price changes are noted this week; certain interests have added $1 to $2 per ton on light black sheets. Plate mills are still unable to book orders under two or three months' delivery, and those who are in a position to run off small tonnage between their contracted output are able to demand a good premium. Blue annealed and deep drawing sheets are still in great demand, with mills unable to supply the requirements of the trade. Wire and wire products are very active, but the high prices are affecting domestic consumption, with the result that many mills are taking on additional export business. Boiler tubes are in exceptionally heavy demand, with the probability of further advances on present price lists.

Metals

The general tone of the market is one of exceptional quietness. Little activity is shown in any of the metals, and prices are inclined to be easier. The position in copper is very uncertain, and some large orders which were supposed to be pending have not materialized. Consumers of tin appear to be well covered at present, and the market is weaker. The supply of spelter, coupled with poor demand, has resulted in reduced prices. Lead is very dull, but the market is firm on a better outlook. The recent arrivals of antimony have exceeded the demand, and a weaker market has developed.

Copper.—The situation at present is rather peculiar in respect to buying and selling of metal. Reports are current that prompt and nearby metal is required, while on the contrary sellers in some instances appear unable to dispose of copper on hand. Under these conditions the market is hard to define. However, while the present market is quiet, there is further inquiry for export metal, but closed orders have not yet been recorded. London reports a strong market on advancing prices; this week's quotation shows an advance of £4 on standard and electro spot, and £5 on standard futures. Current prices are £141 for spot and £135 for future standard, with electro quoted at £154. New York is firm, with the exception of electrolytic, which has declined ½c, present price being 30½c. Local conditions are unchanged, with prices firm.

Tin.—The market is dull, with comparatively little business being done. In the absence of spot metal, ten days' delivery is offered at slightly shaded prices on the nominal figure. The general tone is easier, and further decline may be looked for, but owing to lack of definite information it is difficult to state to what extent the reaction will extend. When buyers become attracted by the declining prices, the effect will be to again strengthen the market.

The London market has weakened, and quotations have declined £3 on standard spot and £2 on futures, with a drop of £3 on spot Straits, the present prices being £198, £197 15s. and £198 respectively.

Following a dull market, New York is quoting 49c, a decline on the week of 1½c per pound. Dealers here are asking 49c on a quiet market.

Spelter.—Reports from dealers indicate a very quiet market, and, while export demand is fair, the inquiry for domestic requirements is comparatively light. The needs of the brass producers, and also the galvanizers, are not very heavy, as is evidenced by the fitful buying of these interests. London prices are firm, while New York has declined ¾c per pound, nominal quotation being 16.8 per pound. The general situation elsewhere is reflected here by a quiet market on declining quotations, present price of 21½ indicating a drop of ½c on the week.

Lead—The market is quiet, with an undertone of increasing activity, owing to a better demand from foreign sources. While prices are unchanged, the situation seems brighter, as dealings in lead are showing a little more life, following a period of relative dullness. London reports a good market with higher prices, an advance of 2s. 6d. bringing spot up to £34 5s., and a 5s. advance on futures makes the current price £34.

New York is quiet, with prices firm, and dealers here report unchanged conditions, with quotations firm at 9½c per pound.

Antimony.—A plentiful supply of both American and Eastern antimony has created the tendency of holders to unload, fearing a further decline. Any excessive selling movement on the present market would result in a still further decline. The possibilities are that the market will become steadier in a short time. A decline of 2½c leaves the New York quotation at 35c per pound. Dealers here report a very quiet market on a decline of 1c, this week's price being 44c.

Aluminum.—With the exception of some heavy Russian buying, the market is unchanged and prices are firm at 68c per pound.

Machine Tools and Supplies

Recent disturbances, affecting the machine tool industry throughout the East and Central States, have somewhat subsided, and conditions are gradually righting themselves, and, while certain trades are still inconvenienced to some extent, the general situation is constantly improving. It is anticipated that any dissatisfaction now existing will be shortly adjusted, with possibly a few exceptions. Many of the shut-downs reported last week in the Pittsburg district have been settled by the men voluntary returning to work. The demand for machine tools in the meantime is comparatively quiet, but builders are still kept busy filling long-placed orders. Inquiries for special equipment is fair, and domestic demand is good. The recent decision of the Government regarding their policy toward railway interests is expected to result in additional equipment for railway purposes. A steady demand continues for all supplies, and prices are constantly advancing.

Old Materials

The majority of scrap metals have been fairly active, and considerable business is reported by dealers in heavy melting steel scrap and old copper. Old lead is easier, and the poor demand for scrap zinc has lowered prices. All coppers are quoted ¼c easier, and quotations range from 18c for light to 21¾c for heavy. No. 1 composition turnings show a decline of ¼c, being quoted at 14¾c per pound. With a reduction of ½c, scrap zinc is now 14½c.

Toronto, May 16. — There is little change to note in the industrial situation. The volume of business generally is increasing steadily and the outlook is satisfactory. War orders are keeping our industrial plants operating at capacity and indications point to continued activity for a considerable time thus enabling the companies concerned to accumulate sufficient reserves of capital to put them in good shape and permit of expansion when desirable. The expenditure on munitions is much greater than in any other industry and consequently the machine shops and engineering plants generally are benefiting in a proportionate degree. These departments are exceedingly prosperous and were never in better shape either financially or in the efficiency of the various plants making munitions or machine tools for their manufacture. The motor car trade is also very prosperous, the sales so far this season being far ahead of the corresponding period last year.

The tendency for higher prices is still in evidence and there is no indication at present of any halt in the upward movement. Raw materials are becoming more difficult to obtain and the shortage of labour is also affecting the situation very materially. Manufacturers are therefore seriously handicapped and their output is being considerably curtailed. The freight situation has improved following the settlement of the teamster's strike in Montreal and the opening of navigation. The movement of goods both to the East and West is heavier and the congestion in the railway yards is gradually being relieved. Railway earnings are showing big gains indicating a considerable increase in the volume of freight being moved.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Steel Market

The situation in the steel trade is generally much the same as last week. Prices have still an upward tendency although the market is steadier and changes are less frequent than formerly. The shortage of steel is more pronounced and there is little hope of any improvement this year as the mills are booked up until the first quarter of 1917 and they are getting further behind on deliveries. The export demand continues heavy and would absorb practically the entire outlet of the mills if the steel companies were in favor of this policy. The demand however for steel for shells is also very heavy and must take precedence over other business.

The advances this week include 25c on boiler and structural rivets, making the new prices $4.85 and $4.75 per 100 lbs., respectively. Pressed steel spikes ⅝ diam., are up 15c, and are now quoted at $3.90 per 100 lbs. A new discount of 25 per cent. on iron plate washers has been announced. Prices on wrought iron pipe are very strong and it is intimated that they will be higher in the near future. Most manufacturers are unwilling to quote on pipe for extensive undertakings because of the uncertainty of the future situation for skelp which is both scarce and high in price. The demand for boiler tubes is very heavy in the primary market and deliveries are now running into the fourth quarter. Prices are strong and are likely to be higher within a short time. The market for cold rolled shafting is also very strong and higher prices are looked for in the near future. All shafting makers have their output sold up practically through the third quarter, and have taken contracts for delivery in the fourth quarter. Prices of all wire products are very firm at the recent advance and higher prices on some lines, particularly wire nails are anticipated.

The sheet market is very firm and prices are unchanged. On blue annealed sheets the mills have very little to offer for delivery inside of five or six months although deliveries on black sheets are not so backward. Some mills are operating only at part capacity as they are unable to get sufficient sheet bars. There is no improvement in the galvanized sheet situation some mills are operating their galvanizing departments at only about 25 per cent. capacity. Prices on galvanized sheets are firm and unchanged.

Heavy contracts are still being placed in the United States for steel by the

Allies and the mills continue operating at capacity. The unfilled tonnage of the United States Corporation for April totalled 9,829,551 tons being an increase of 498,550 tons over the previous month March. The market is much steadier and there is a decided sentiment against a further advance in prices of finished materials. Prices are however very firm, steel bars being quoted at 3c; plates 3.75c, and shapes 2.60c, f.o.b. Pittsburgh. A leading railroad in the U.S. recently placed an order for 1000 wooden underframe box cars with the American Car & Foundry Co. This is a phase of the steel situation which is of considerable significance.

Old Materials

The market is quiet, and prices are generally unchanged although firm for most scrap materials with the exception of lead and zinc which are weaker. Wrought iron pipe is higher and is now quoted at $10; being the only change of any particular importance to note.

Machine Tools

The market is steady with a fair demand for tools for munition plants principally for single purpose lathes for machining the larger calibre shells. Delivery on this class of equipment is good but standard tools particularly millers, planers and grinders are hard to get inside four to five months. The Grand Trunk Railroad is in the market for considerable number of tools for the various repair shops throughout the system. The list includes lathes, drill presses, slotters, shapers and planers, etc.

Supplies

Prices of machine shop supplies continue to advance and further changes have been made during the week, Malleable and cast iron pipe fittings have advanced about 5 per cent. A new list of discounts on carbon drills and reamers has been issued, standard drills up to 1½ in. being now 45 per cent. Leather belting has advanced the new discount on extra heavy being 40 per cent. as against 40 and 10 per cent. formerly. Both linseed oil and turpentine are weaker and lower prices are being quoted. Turpentine is now 70c per gallon while linseed oil is 89c for raw and 92c for boiled oil. Starrett's mechanics tools have recently been adjusted in price to cover an increase of about 10 per cent.

Metal Markets

The copper market continues strong and the situation interesting. Prices are unchanged for all metals with the exception of antimony which is lower. The tin market is steadier with a firmer undertone. The lead market which was weak has recovered and the outside market is a shade higher this week although the 'Trust' price is unchanged Spelter is very weak with little business doing. Aluminum is unchanged and the market featureless.

Copper.—A good demand for copper is still in evidence both for export and domestic consumption. So far as the big producers are concerned there is now no metal available for sale before September. Heavy sales of September delivery are reported from New York at 29c per lb., and the fact that there is but a limited quantity of September copper left, indicates an early advance in this position. Quotations in London have advanced far beyond previous records and are still tending upwards. The local market is firm and unchanged at 32c per pound.

Tin.—There is a better feeling in the market as it is anticipated that shipments of tin will come forward from England in better volume that has hitherto been the case. Prices have been declining steadily, chiefly on spot tin, owing to lack of demand but there is now a firmer feeling and the market is steadier and unchanged at 54c per pound.

Spelter. — The market is dull and weak. A lack of demand from brass producers is in evidence as well as only hand-to-mouth buying by the galvanizers. The local market is weak and unchanged at 22c per pound.

Lead.—The situation in the lead market has improved considerably in New York on account of an increase in the export demand. The outside market has recovered and is higher, but the "Trust" is unchanged at 7.50c, New York. The local market is firmer and unchanged at 9½c per pound.

Antimony.—The continued lack of demand for antimony has caused prices to sag and the market is unsettled. Local prices are lower and nominal at 45c per pound.

Aluminum. — The demand continues dull and the market featureless. Quotations are unchanged and nominal at 60c per pound.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

CANADIAN RAILWAY CLUB ANNUAL

THE fourteenth annual meeting of the Canadian Railway Club took place on Tuesday evening last at the Windsor, Montreal. R. M. Hannaford occupying the chair. The secretary's report went to show that the past year had been a fairly good one. Allusion was made to the fact that the president, L. O. Ord, had enlisted and gone overseas, his place being filled by R. M. Hannaford, first vice-president. Some twenty-three of the members had gone to serve their King and country, and two of them, Messrs, W. C. Rutherford and L. Curry, had fallen on the field of honor. The following officials were elected, the president being re-elected.

President R. M. Hannaford, assistant chief engineer, Montreal Tramways Co., Montreal; first vice-president, G. E. Smart, master car builder, Canadian Government Railways, Moncton, N.B.; second vice-president, Prof. Keay, professor railway transportation, McGill University, Montreal. Executive committee—Messrs. T. C. Hudson, master mechanic, Canadian Northern Quebec Ry., Joliette, Que.; E. E. Lloyd, auditor of stores and mechanical accounts, Canadian Pacific Ry., Montreal; J. Hendry, master car builder, Grand Trunk Ry., Montreal; C. Manning, secretary to superintendent of motive power, G.T.R., Montreal; C. W. Van Buren, general master car builder, C.P.R., Montreal; W. H. Winterrowd, assistant to chief mechanical engineer, C.P.R., Montreal. Audit committee—Messrs. F. A. Purdy, Canadian manager, Chicago Car Heating Company, Montreal; A. Crumpton, assistant valuation engineer, G.T.R. Montreal; A. G. Mitchel, chief clerk, office of master car builder, G.T.R. Montreal. Secretary, James Powell, chief draughtsman, motive power department, G.T.R., Montreal. Treasurer, W. H. Stewart, assistant superintendent, C.P.R., temporarily with the Imperial Munitions Board, Ottawa.

WELLAND SHIP CANAL PROGRESS

THAT, notwithstanding the war, most satisfactory progress has been made on the four sections of the Welland ship canal which have already been contracted for, and that three at least of these sections will be finished within the four-year schedule, the work having been

started in 1913, was the statement of Chief Engineer J. L. Weller, who planned and is in charge of this undertaking, which will cost Canada $60,000,000 or $70,000,000. Fifty per cent. of the contracts on Nos. 1 and 2 sections are completed.

On No. 3 section, at Thorold, which is the largest section, having three double locks, and which contract costs the sum of $10,000,000, only about 25 per cent. of the work is finished. This section, Mr. Weller says, will not be finished on schedule time, but will run along into 1918 at least. The work there is proving very heavy, it being necessary to blast through the solid rock down 80 feet. The blasting is about finished for the first pair of locks, which will be bigger than those of the Panama Canal. It was on this section that the strike occurred recently, but the majority of the men are back at work.

Section 4, between Allanburg and Thorold, has not yet been let, but section 5, at Allanburg, is half completed.

MAKING FRENCH HELMETS

IN turning out one of the plain steel helmets worn by French soldiers, 64 distinct operations are necessary. The first step in stamping out discs from large sheets of steel, a special machine being used for the purpose, exerting a pressure of 150 tons, and capable of cutting out 5,000 steel discs a day. Each disc is placed under a shaping machine, which presses the disc into the form of a helmet with a broad rim. Polishing and cutting machines remove all irregularities in the helmet, after which holes are punched in the crown, some for ventilation purposes, others for fastening on the regimental crest. Each helmet is cleaned and dipped in a special mixture, which makes it a dull, inconspicuous bluish gray. A lining and leather chin strap are then fastened on, and the helmet is complete. Since the French army has been protected with the helmet, the number of deaths due to wounds in the head has decreased to a remarkable extent.

Electro-Platers' Convention.—The Annual Convention of the American Electro-Platers' Society, which was to have been held at Toronto, Ont., this year, will on account of the war, be held in Cleveland, instead, with headquarters at the Hotel Statler, on July 6, 7 and 8. A large number of interesting papers on plating and non-ferrous metallurgy will be presented. The Cleveland branch of the society is arranging a suitable entertainment program.

New Trade Commission.—The following have been named as the commission of six Canadians who will go to Europe to examine opportunities for the extension of Canadian trade among the allied nations: James W. Woods, Toronto; Theo. H. Wardlworth and Frank Pauze, Montreal; H. Edmond Dupre, Quebec; W. Frank Hatheway, St. John, and George W. Allan, Winnipeg. The commissioners will proceed to Europe shortly and they will visit Great Britain, France, Belgium and Italy.

CANADIAN COMMERCIAL INTELLIGENCE SERVICE

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC

H. R. Poussette, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALASIA

D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES

E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA

J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA

Acting Trade Commissioner, Lonja del Comercio, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE

Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Standacona.

JAPAN

G. B. Johnson, P.O. Box 109, Yokohoma. Cable address, Canadian.

HOLLAND

Acting Trade Commissioner, Zuidbaak, 26, Rotterdam. Cable address, Watermill.

NEWFOUNDLAND

W. B. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND

W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA

W. J. Egan, orwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM

Acting Trade Commissioner, Sun Building, Clare Street, Bristol. Cable address, Canadian.

J. E. Ray, Central House, Birmingham. Cable address, Canadian.

J. Forsythe Smith, Fruit Trade Commissioner, North British Building, East Parade, Leeds. Cable address, Canadian.

F. A. C. Bickerdike, Canadian Chambers, 36 Spring Gardens, Manchester. Cable address, Cantracom.

J. T. Lithgrow, 87 Union Street, Glasgow, Scotland. Cable adress, Contracom.

Harrison Watson, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London.

SPECIAL TRADE COMMISSIONER—LUMBER

H. R. McMillan, visiting Europe, Africa, Australasia and the Orient.
C. F. Just, Russia.

CANADIAN COMMERCIAL AGENTS

BRITISH WEST INDIES

Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian.

R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK

C. E. Sontum, Grubbeged No. 4, Christiana, Norway. Cable adress, Sontums.

SOUTH AFRICA

D. M. McKibbin, Room 34, Permanent Buildings, Harrison Street, Johannesburg.

E. J. Wilkinson, Durban, P.O. Box 673, Durban, Natal.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM

W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England.
Cable address, Dominion, London.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Winnipeg, Man.—The Breen Motor Co. will build a garage on Broadway, 116 ft. by 50 ft.

Montreal, Que.—Darling Bros., engineers, are building a $30,000 addition to their factory.

Simcoe, Ont. — Lampman's Pump Works on Peel street, were totally destroyed by fire on May 11.

Farnham, Que.—The Dominion Safe & Vault Co., are removing their plant to Niagara Falls, Ont.

Niagara-on-the-Lake, Ont.—It is proposed to install electrically driven pumps in the water works plant here.

Hamilton, Ont.—The Hamilton Bridge Works, will build a steel and concrete addition to its plant at a cost of $7,500.

Renfrew, Ont.—The Renfrew Machinery Co., will have work commenced at once on the erection of a factory to cost $8,000.

Vancouver, B.C.—Efforts are being made by the Chamber of Mines to secure the establishment of an iron smelter near here.

Mount Forest, Ont.—J. R. Baird, is in the market for an air compressor, complete with motor or gasoline engine for a garage.

Three Rivers, Que.—The Wayagamack Pulp & Paper Co., will build an extension to their paper mill here to cost about $11,000.

Meaford, Ont.—The Meaford Wheelbarrow Co., is in the market for a tinsmith's brake 6 ft. long, to bend 16-gage sheet iron.

Toronto, Ont.—The Martin Pump & Machine Co. propose erecting a factory at Wilton and Broadview avenues, estimated to cost $10,000.

Timmins, Ont.—The Hollinger Gold Mines, are building an addition to their mill, estimated to cost $750,000. Mining machinery will be required.

Toronto, Ont.—The Wilson Munitions have taken out a permit for a one-storey brick moulding shop in 438 Dufferin street to cost $1800.

Berlin, Ont.—The Consolidated Felt Co., is in the market for a hydraulic pump of 2000 lb. per sq. in. pressure for a 16-in. diameter cylinder press.

Glenwood, Ont.—The Dominion Natural Gas Co. will probably install a duplicate gas purification plant here. Mr. Thom is manager of the company.

Redcliffe, Alta.—The Canadian Western Steel Co., which recently purchased the Redcliffe Rolling Mill, will establish a plant here for making nuts and bolts.

Galt, Ont.—The Goldie & McCulloch Co., manufacturer of boilers, condensers, etc., will commence at once the erection of an addition to its plant to cost $100,000.

Berlin, Ont.—Bids will soon be asked on large addition to the boiler house and plant of the Gas & Electric Co., Gaukel street, Mr. McIntyre is superintendent of the plant.

Timmins, Ont.—The Hollinger Gold Mines will shortly start work on an addition to their mill. Estimated cost, $750,000. Secretary-treasurer, David A. Dunlap, 85 Bay Street, Toronto.

Montreal, Que.—W. Duquette, has received a permit for the erection of a reinforced concrete, four-story garage to be constructed at the corner of Laurier Avenue and Durocher Street, Outremont, at a cost of $50,000.

Montreal, Que.—J. D. Lachapelle & Co., engineers, Montreal, are laying out and doing the purchasing of electrical equipment for the new plant which is being installed at Montmagny, Que., for the General Car & Machinery Co.

Toronto, Ont.—T. A. Russell, representing the Russell Motor Co., has made application to the York Township Council for a fixed assessment for 20 years on 30 acres of land and a factory, which it is proposed to build near Weston. The first cost of the buildings will be $100,000.

G. T. R. BUYING MACHINE TOOLS

The Grand Trunk Railway is in the market for machine tools for the various repair shops throughout the system, embracing Battle Creek, Mich.; Pontiac, Mich.; Stratford, Ont.; Allandale, Ont.; Island Pond, Vt.; Toronto, Ont., and Montreal, Que. The equipment required includes drill presses, lathes, millers, planers, shapers, slotters, flanging presses, etc. Full particulars may be obtained from G. W. Caye, general purchasing agent, G. T. R. offices. McGill Street, Montreal.

SAW-MILL MACHINERY REQUIRED IN RUSSIA

Makers of saw-mill machinery will learn with interest that Russia now occupies first place among the nations of the world in the extent of its timber resources. The total area of the Empire is about one-seventh of the land surface of the globe, and 39 per cent. if it is under forests.. Those in European Russia cover an area of 474,000,000 acres; in Finland, 50,500,000 acres; in Poland, 6,700,000 acres; and in Caucasus 18,600,000 acres; a total of 549,800,000 acres, exclusive of Siberia. The Russian Forestry Department places the total timber land in Siberia at 810,000,000 acres, of which two-thirds can be successfully placed on the market.

Electrical

Fredericton, N.B.—The city council contemplate installing a modern fire alarm system.

St. Foye, Que.—The town council are considering the installation of an electric lighting system, estimated to cost $15,000.

Stratford, Ont.—The town council are considering extensions and improvements to the electrical system, estimated to cost $33,000.

Toronto, Ont. — The Scarborough township council have opened negotiations regarding the lighting of the Kingston Road, Scarborough Junction and Agincourt.

Uxbridge, Ont.—The Hydro Commission have written the town clerk stating that an engineer would be in Uxbridge in the near future to report on the possibility of furnishing the town with electric power.

Welland, Ont.—The Stamford council has approved of the purchase of the Ontario Distributing Co. system. A bond issue for $30,000 will be raised to cover the cost of the transaction, part of the money to be used to cover the cost of extensions to the distributing system.

Municipal

Elmira, Ont.—It is proposed to loan $15,000 to the Colonial Knitting Co.

Vancouver, B.C.—The City Council are in the market for a centrifugal pump and motor.

Sutherland, Sask.—An expenditure of $36,000 on waterworks and street improvements is contemplated.

Stratford, Ont.—A bylaw will be voted on to provide $30,000 for improvements to electric distribution plant.

Dundas, Ont.—The by-law to provide $55,995 for the construction of sewage disposal works, etc., has been defeated by the ratepayers.

Sherbrooke, Que.—It is proposed to spend $300,000 on the development of power at Westbury Basin. A by-law will be submitted on June 19.

Elmira, Ont.—The ratepayers on May 9 voted in favor of a by-law to grant a loan of $6,000 to the Ardiel Shoe Co. Two other industrial by-laws are to be voted on next week. The Ardiel Co. is in operation here now, but will extend the plant with the $6,000 afforded them by the by-law.

St. Catharines, Ont.—The City Council has passed a by-law to issue debentures to the amount of $84,000 for extensions to the hydro-electric system.

Hull, Que.—A by-law will be voted on by the ratepayers on May 22 to raise $146,000 for improvements to the waterworks, electric light and fire alarm system.

Preston, Ont.—A by-law to vote a loan to the Electrical Fittings & Foundry Co. was carried by a large majority on May 8. The new concern will occupy the large building that was erected for the Anchor Bedding Co., but which was never used.

QUEENSLAND GOVERNMENT RAILWAYS, BRISBANE

The following indent was recently despatched by the Queensland Government Railways, Brisbane, to the Agent-General for Queensland, Marble Hall, 410 The Strand, London, England:—

		Estimated Cost. £	s.	d.
1	set turbo generator set, 300 kilowatt capacity	3,800	0	0
2	centrifugal pumps, with motors complete	500	0	0
2	water tube boilers to supply turbo generator	4,000	0	0
1	coal and ash handling plant—steam driven	2,800	0	0
1	electrically driven two stage intercooled air compressor	1,500	0	0
1	switchboard, instruments, etc.	600	0	0
1	one Pond wheel lathe, motor driven	1,800	0	0
1	two table 36-inch boring mill, belt driven	830	0	0
1	profile milling machine, motor driven	900	0	0
1	plain milling machine, belt driven	300	0	0
1	slotting machine, belt driven	200	0	0
1	slide bar grinding machine, belt driven	220	0	0
1	one 14-inch x 50-inch plain grinding machine, belt driven	400	0	0
1	one 4' 2" radius high speed, motor driven, radial boring tapping and studding machine	350	0	0
1	light drilling machine, belt driven	45	0	0
1	power hacksaw 6-inch, belt driven	50	0	0
1	24-inch heavy duty shaping machine, belt driven	145	0	0
1	12-inch surfacing and screw-cutting lathe, motor driven	400	0	0
1	Gridley automatic turret lathe, 2¼ bar size, motor driven	500	0	0
1	two head screwing machine, belt driven	250	0	0
1	one hydraulic crank pin press	125	0	0
1	Lumsden tool grinder (oscillating), belt driven	210	0	0
1	small 6-inch lathe for tool work, belt driven	120	0	0
1	universal milling machine, belt driven	200	0	0
1	tool hardening furnace and pyrometer, gas and air	50	0	0
1	15 cwt. hammer	600	0	0
1	10 cwt. steam hammer	500	0	0
2	"Acme" root blower, motor driven, complete for fifty fires	500	0	0
3	additional motors	300	0	0
1	40 ton overhead traversing girder crane, electric driven	2,000	0	0
1	automatic knife grinder, 30-inch	45	0	0
1	small jig saw	30	0	0
1	saw sharpening and gulloting machine, mill web or circular saw	30	0	0
1	emery grinder for general tool work	20	0	0
1	double spindle shaper, capacity 6" x 6" with grooved table for fixtures	60	0	0
1	chain mortising machine, with chain and grinding attachments	70	0	0
1	planing and smoothing machine, motor driven	250	0	0
1	moulding machine, 4 head capacity, 18" x 16" motor driven	375	0	0
1	horizontal square chisel mortiser, 18" x 18" timber with boring attach't., motor driven	325	0	0
1	heavy rip-saw, colonial type bench, 6' x 3' x 9", maximum, saw 48"—motor driven	150	0	0
1	small tenoning machine	60	0	0
1	wood-working machine with cutters, motor driven	400	0	0
	Additional cutters for machines	200	0	0
3	additional motors	640	0	0
	Total	£26,850	0	0

Campbellford, Ont.—A by-law will be submitted to the ratepayers on May 22 to authorize a loan of $30,000 to the Northumberland Paper & Electric Co.

Westport, Ont.—The ratepayers will vote on May 31 to give Westport Electric Light & Milling Co., a ten-year franchise for installing an electric lighting system.

Belleville, Ont.—The City Council is contemplating the making of a number of additions to the waterworks plant, including a new pump to be installed at the pumping station.

St. Thomas, Ont.—At a special meeting of the City Council on May 10, it was decided to issue debentures for the purpose of building a hydro-electric substation on St. Catharine Street.

Medicine Hat, Alta.—The City Council contemplate the construction of another pipe line from the waterworks plant to the city. The total cost will be about $25,000, including $16,000 for pipe.

General Industrial

Preston, Ont.—The Solid Leather Shoe Co., are building an addition to their factory.

Montreal, Que.—The Columbus Rubber Co., Maisonneuve, are making an extension to their factory.

Sackville, N.S.—The factory of the A. E. Wry Standard Co., which was destroyed by fire some months ago is being rebuilt.

Port Arthur, Ont.—It is reported that an industry is to be established in this neighborhood for the manufacture of pine tar products.

Camrose, Alta.—The elevator at New Norway near here belonging to Jas. Richardson & Son, of Calgary, was destroyed by fire recently. The loss is fully covered by insurance.

Sarnia, Ont.—The cost of building the new flax mill here, which is to commence shortly, is estimated at $15,000. The promoters of the company are completing arrangements for its construction.

Markham, Ont.—A new milling company is being formed here with a capitalization of $75,000. It is proposed to erect a mill of the latest type, valued at $60,000, a short distance from Markham station. A. Ward Milne, of this town is interested in the company.

Winnipeg, Man.—The Stovel Co. will replace the building recently destroyed by fire with premises estimated to cost $250,000. The building will be located on the site on Bannatyne avenue, which is partly occupied by the plant established there some time ago. John Woodman, of Winnipeg, is the architect.

Personal

Charles L. Marble has been appointed manager of the Wayne Oil Tank & Pump Co., of Woodstock, Ont.

W. S. Robertson, general manager of the Electric Power Co., has sent in his resignation to take effect at the end of the present month.

R. J. Gordon, D.L.S., is returning to Lethbridge, Alta., as resident engineer for the provincial government. He formerly held that position here.

LOGGING MACHINERY FOR BURMAH

In a communication to the Departmest of Trade and Commerce, H. R. MacMillan, Special Trade Commissioner, states that an opening exists in Burmah for Canadian machinery used in logging operations. Authority has just been granted by the Government for the purchase of one logging engine, to haul logs up to a maximum of 3 tons weight, a distance of 3,000 feet over smooth ground, and although previous machines have been of American construction, a Canadian machine would now be preferred. If this order were satisfactorily executed, it is stated that further business could undoubtedly be secured as forest development is only in its initial stages in Burmah. Canadian manufacturers should communicate immediately with the Conservator of Forests (whose name and address will be supplied on application to the Department. Refer File No. A-2017) and forward catalogues, price lists, and complete description of types of engines.

Wilford Philips, manager of the Winnipeg Electric company, has returned to Winnipeg after a sojourn of five months in California, for the benefit of his health.

J. E. Hargan, superintendent of the John Morrow Screw & Nut Co. plant, Ingersoll, Ont., was recently presented with a writing desk, chair and club bag by the employees.

Augustin Frigon, C.E., has resigned from the firm of Surveyer & Frigon, consulting engineers, Montreal, to become engineering manager of the Canadian Siegwart Beam Co.

William Angus for many years manager of the Royal Pulp & Paper Co., died at Montreal on May 12 aged 81. The deceased was born in Glasgow, Scotland and came to Canada 63 years ago.

Frederick Wells Avery, of Ottawa, millionaire lumberman, died on May 11 at the General Hospital, Montreal, following an operation. He was born in New York in 1852, and came to Canada in 1878.

F. Chandler, who has been the superintendent of the shell department in the Frost & Wood Co.'s works, Smith's Falls, Ont., for some time past, has resigned to accept a similar position in Toronto.

Roy Campbell, of Montreal, secretary of the Canadian Manufacturers' Association, has been chosen as secretary of the Trade Commission recently appointed by Sir George Foster to go to Europe and investigate possible trade openings among the allies.

R. B. Watson, general manager of La Rose Consolidated Mines for a number of years past, has resigned, and **G. C. Bateman,** who has been identified with the Canadian Mining & Exploration Co. will take his place. Mr. Watson will devote his attention to his private mining interests.

L. G. Ireland, who for the past three years has been general manager of the Brantford Hydro-Electric Commission and Municipal Railway Commission, has resigned. He has been appointed chief engineer of new hydro development in Eastern Ontario. He was for five years connected with construction work here.

Lieut.-Col. B. J. McCormick has completed arrangements for raising his new command, the 213th Battalion. Col. McCormick recently returned from Flanders. While there he was attached to headquarters, 4th Brigade, under Brig.-Gen. Rennie. He is a native of Port Huron, Mich., but held the position of Industrial Commissioner in Welland, Ont., for eight years prior to the war.

Trade Gossip

St. Boniface, Man.—The Rice Malting Co. of Canada will rebuild their plant, recently destroyed by fire. Manager, P. H. Rice.

The Canadian Locomotive Co., of Kingston, Ont., has received a contract for thirty locomotives from the Canadian Government.

Montreal, Que.—It is reported here that A. B. Mackay, of Hamilton, has acquired a controlling interest in the Montreal Transportation Co.

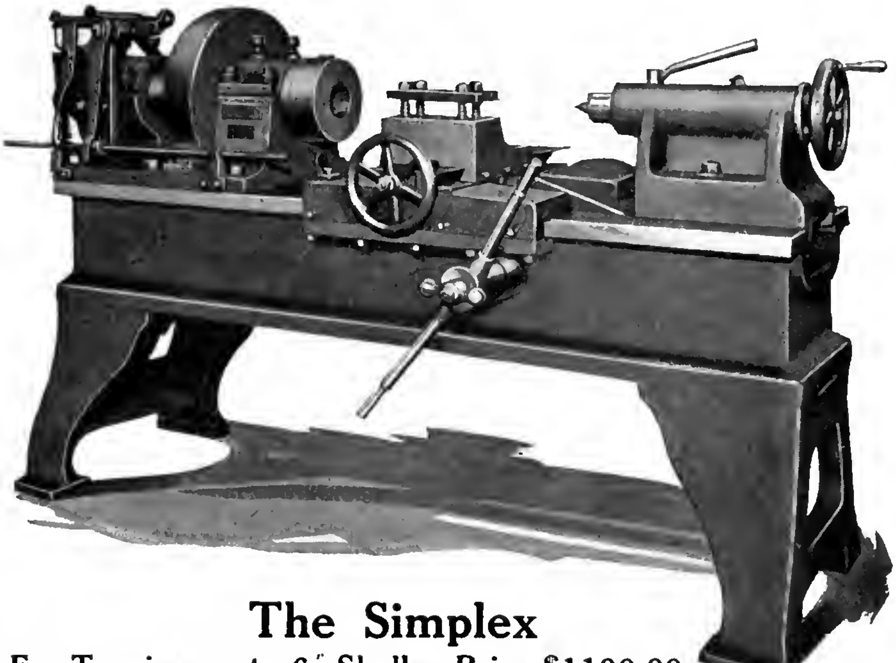
Williams Heavy Duty Projectile Turning Lathe

Shell Perfection! You are certain of that if you have the right machine, but how you dread an inspection if you are equipped with inferior machines. Illustrated here we show one of the most perfect machines for doing rough work, it does it well, it does it perfectly, which is just the machine you want. ACCURACY and SIMPLICITY are the qualities which have featured this machine.

SPECIFICATIONS

Length of Bed ....8′ 6″
Width of Bed ....19½″
Depth of Bed ....13″
Front Bearing of Spindle (4.5″ Shells) 6½″ dia. x 7½″......Bored 4 19-32″ dia.
Front Bearing of Spindle (6″ Shells) 8 13-16″ dia. x 7½″......Bored 6⅛″ dia.
Rear Bearing of Spindle..............5¾″ x 7½″
Flange on Front of Spindle..............12″ dia.
Size of Driving Pulley ....Dia. 13″ x 8″ face
Swings over Bed ....19″
Takes between Centres ....4′ 2″
Dia. of Turret (6 holes for bars 3″ to 2¾″ dia.) ....20″
Length of Saddle ....34½″
Feeds ....1-16″, ⅛″, 3-16″
Pilot Wheels geared 4 to 1. Ball thrusts throughout.
Shipping Dimensions (Boxed) 10′ 0″ x 4′ 0″ x 5′ 3″
Net Weight ....4,800 lbs.
Shipping Weight (For Export).........5,000 lbs.

Oil Pan is always supplied



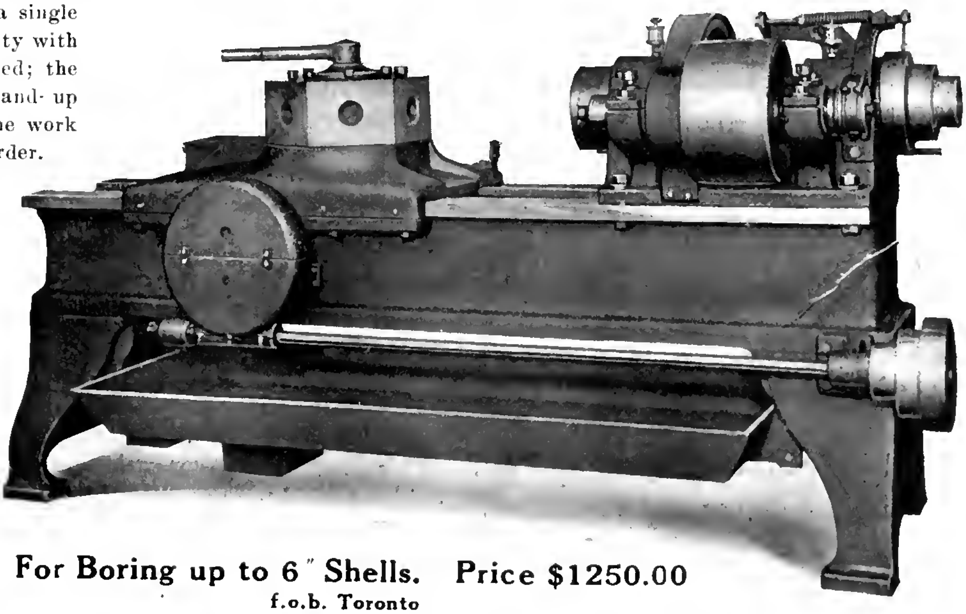
The Simplex
For Turning up to 6″ Shells. Price $1100.00
f.o.b. Toronto

Williams Shell Boring Lathe—Simplex Type

A tower of strength—this is proved by a single glance at the illustration. Note the solidity with which the head stock is bolted to the bed; the hexagon turret is built especially to stand up perfectly under the heaviest cuts, and the work it produces—it is of the most finished order.

All machines we exhibit have been subjected to a most severe test, just to see if they are as good as we think they are; the fact that we are advertising them is conclusive proof that they have stood the test. The large diameter spindle, fitted into bronze bushings, is provided with large collar on front end instead of threaded nose and chucks. The carriage and feed are of good length and securely gibbed to the bed. The feed is transmitted by belt from spindle to worm.

Profiling taper and other attachments can be supplied at extra cost, but must be ordered with the machine.



For Boring up to 6″ Shells. Price $1250.00
f.o.b. Toronto

THE A. R. WILLIAMS MACHINERY CO., LTD.
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER
Canada's Leading Machinery House

Tungsten Ore in U.S.—The production of tungsten ores in the United States during 1915 broke all records. It was equivalent to about 2,165 short tons of concentrates, carrying 60 per cent. of tungsten trioxide, and was valued at more than $2,000,000.

The Paper Industry.—The growth of the export paper industry is one of the most striking factors in the recent industrial history of Canada. The great bulk of this trade is with the United States, which took about 14 million dollars out of about 16 million of exported news print paper in the 11 months of the fiscal year to February 28. Most of the small remainder goes to British Dominions.

The "Vancouver Island Marine," has been incorporated with a capital of $250,000, and head offices at Victoria, B. C. The company propose to engage in shipbuilding operations and to proceed with the construction of one or more vessels at the port of Victoria for the off-shore lumber trade. Charles J. V. Spratt, manager of the Victoria Machinery Depot, is the promoter of the Vancouver Island Marine.

Montreal, Que.—It is officially announced that the Cunard Co. have taken over the steamers owned and controlled by the C. N. R. The steamers in question are those which, before the war, were running to Avonmouth and Rotterdam, and the services will be maintained between Canada and ports in the United Kingdom and on the continent. Steamship services on the Pacific Ocean are also in contemplation.

Quebec, Que.—The St. Maurice Mines Co., with a capital of $400,000, has been incorporated to prospect and exploit mines in the counties of Montcalm, Pontiac and in the Temiscamingue, and also in the Abitibi region. The promoters of the company are Messrs Albert Edward Turner of London, England; W. E. Simpson, of Grantown-on-Spey, Scotland, engineer; Daniel E. Moran, of New York City, engineer; A. Doucet, C.E., and George Belleau, bank inspector of Quebec. The head offices of the company will be in Quebec City.

Machinery for Russian Government.—C. F. Just, the Canadian Trade Commissioner in Petrograd, cables that a large number of road rollers and other machinery will be wanted by the Russian Government in connection with the Empire roads construction programme. A number of 12-ton steam road rollers are required at once. The cable says the Russian Government also wants tenders on five locomotive cranes; working parts for ten ladder dredges, comprising buckets, chains, drums, steam engines, capacity 150 to 250 cubic metres per hour, total working depth five metres commencing frim water level. Firms tendering, to supply working drawings for remaining necessary plant, including pontoon constructed in Russia; early delivery essential; quotations f.o.b. New York.

Large Order For Locomotives.—It is announced that the New South Wales Railway Commissioners have let a contract for the supply of locomotives approximating in value to $5,000,000. The contract is for 300 engines, to be supplied by the Clyde Engineering Co. of Sydney, during a period of five years. This is understood to be the largest order for locomotives that has been given in the Commonwealth, and it represents the policy of the Government of making the State self-contained industrially. This order may be of interest to Canadian manufacturers of locomotive supplies, as a considerable proportion of the materials and fittings used in the construction of the engines will, as heretofore, likely be imported from oversea.

Newcastle, N.S.W., Steel Works.—Since the industry was started, over $7,500,000 has been expended on the Newcastle Steel Works, and additional plant is being installed to cope with the active Australian demand for iron and steel products. Arrangements have been made for the erection of four more open-hearth furnaces (making seven in all) and the first of these is nearly completed. The demand for pig iron has been much larger than anticipated, while the demand for steel products is considerably in excess of the present productive capacity of the works. The production of steel at a time when freights are abnormally high and imported steel scarce is invaluable to manufacturers in Australia.

Tenders

Charlottetown, P.E.I.—Tenders will be received by the engineers, R. S. & W. S. Lea, Montreal, until May 20, for the erection of a pumping station and installation of a one-million-gallon pump at Charlottetown.

Toronto, Ont.—Tenders will be received addressed to the chairman, Board of Control, City Hall, up to May 23, 1916, for the complete construction of a steel frame, brick-faced tile addition, including heating plant, to the St. Clair avenue car barn, Christie street. Specifications and forms of tenders may be obtained upon application at Room No. 311, Department of Works, City Hall.

Toronto, Ont.—Tenders addressed to the secretary-treasurer of the Board of Education will be received until May 23, 1916, for science apparatus, chemicals, etc., for Collegiate Institutes and High Schools. Specifications may be seen and all information obtained at the office of the clerk of supplies, Room 308, City Hall.

Toronto, Ont.—Tenders will be received by the chairman Board of Control, City Hall, up to May 23, 1916, for the supply and delivery of: One single truck, double end, street car, completely equipped; one car body, double end, single truck; equipment for one single truck car, electrical equipment; equipment for one single truck car. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Contracts Awarded

Winnipeg, Man. — The Dominion Bridge Co., has been awarded the contract for a bridge between Winnipeg and St. Boniface to cost $360,000.

Fredericton, N.B. — The Provincial Government has awarded a contract for the construction of the Aroostook River Mouth Bridge to Engineers & Contractors, the price being $20,000.

Rosetown, Sask.—The contract for the construction of the Rosetown Northern Telephone Co. system has been awarded to the Northwestern Construction Co., of Saskatoon. The contract calls for the construction of forty-eight miles of telephone line.

Hamilton, Ont.—The Board of Control's recommendation that the Gutta Percha & Rubber Co., be awarded the contract for 1,000 feet of 2½-inch hose was amended to read 500 feet. The Goodyear Rubber Co. was awarded the contract for the other 500 feet.

New Incorporations

Harry Tolton, has been incorporated to manufacture machinery at Berlin, Ont., with a capital stock of $150,000. The provisional directors are Edwin P. Clement, E. W. Clement, Wm. Clement, of Berlin.

The St. Charles Chemical Co., has been incorporated at Ottawa with a capital of $100,000 to manufacture all kinds of chemicals at St. Charles Barromee, Que. Incorporators, J. A. Guibault and H. Trudeau of Joliette, Que.

The Parker Shoe Co.has been incorporated at Ottawa with a capital of $49,000 to manufacture boots and shoes, leather goods, etc., at Preston, Ont. The incorporators are: S. H. Parker, G. Fink, and W. S. Hadson, all of Preston, Ont.

Winning the Buyer's Favor

The best possible buyer is not made an actual buyer at a single step.

It is one thing to win the buyer's favor for an article and another to make adjustments incident to closing the sale. Winning the buyer's favor is the work of trade paper advertising.

Under ordinary conditions it should not be expected to do more.

Catalogues

The York Mfg. Co., York, Pa., have issued a bulletin dealing with the "York" enclosed refrigerating machine which is well adapted for markets, dairies, ice cream factories, etc. The bulletin is illustrated and the important features of the machine are briefly described.

The Bayer Steam Soot Blower for Torizontal Fire-Tube Boilers, is the title of a new 16-page bulletin just published by the Bayer Steam Soot Blower Co., St. Louis. The bulletin shows details of construction and operation and contains the experience of users and manufacturers. A free copy will be sent to engineers on request.

Fittings.—The Detroit Valve & Fittings Co., Detroit, Mich., have issued catalogue No. 3 to the trade. The piece list on straight size fittings has been revised and a piece list added on all reducing sizes. These lists are based on the estimated average weights of the fittings and so figured that piece fittings take a uniform discount. This list includes malleable iron fittings for steam, gas and water, drainage fittings and specialties also malleable and grey iron castings. The price lists are very complete and the catalogues fully illustrated.

The Prevention of Scale Formation is the title of a bulletin issued by the Buckeye Skimmer Co., Toledo, Ohio. The basis of the bulletin is a short talk on scale, and its removal from steam boilers by using the "Buckeye" boiler skimmer. The formation of scale in boilers and its removal is dealt with in a general way followed by a description of the "Buckeye" skimmer and its method of operation. The claims made for this apparatus are dealt with at length accompanied by illustrations showing it installed in various types of boilers.

Electric Pyrometers.—Catalogue No. 1,400 deals with an interesting range of electric pyrometers made by the Wm. H. Bristol Co., Waterbury, Conn. The development of the "Bristol" pyrometer and general advantages of the thermo-electric systems are dealt with followed by a partial list of important applications. The various types of pyrometers, indicating switchboards, and scales are illustrated and described accompanied by price lists of all sizes and types. Particulars are given of therm-o couples with illustrations showing the method of application. The catalogue concludes with a partial list of users and illustrations showing a great variety of temperature measuring instruments manufactured by the company.

Book Review

The Motor Car, by Duncan McMillan. 157 pages, 7¼ in. x 4¾ in., 136 illustrations. Published by Longmans, Green & Co., London, Eng. Price 90 cents net. This book is the latest addition to the Longmans' Technical Handicraft Series of publications. It is written in a clear and comprehensive manner and deals with the construction and operation of the modern motor car in such a way as to be readily understood by those who do not necessarily possess an extensive knowledge of mechanics. The author's idea has been to take a straight course through the typical modern motor car, beginning at the engine and finishing at the road wheels. The principles underlying the various parts of the car are explained and illustrated by means of simplified diagrams, these being followed by illustrations from drawings and photographs of the actual parts. All variations from the main types have been excluded and no special attempt has been made to deal with the details of the latest designs. The book contains fifteen chapters devoted to the following subjects. Horse power and rating, general arrangement of a car, the engine, carburetors, ignitions of various types, clutches, the gear box, the differential bearings and brakes, steerings and controls, care of the car and tires, the two-stroke engine, and sleeve and rotary valve engines. The book is printed in bold type and the drawings, etc., from which the illustrations have been taken have been carefully prepared. It contains a lot of valuable information for both the car owner and mechanic set forth in a clear and concise manner.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

SIX-FOOT METAL PLANER FOR SALE—practically new. Apply A. Graham Boyd, 100 Front St. E., Toronto. (14)

TWO FOX TURRET LATHES FOR SALE—splendid condition. Ideal Foundry, 960 Gerrard St. East, Toronto. Phone Gerrard 1055. (15)

FOR SALE — ONE NEW FORD SMITH Grinder for Shrapnel. A short time ago we purchased five, find four will take care of our work. The National Manufacturing Co., Brockville, Ont.

1—2-SPINDLE SHAPER, WOOD TOP, JOHN Ballantyne, Preston, make. used two months. 1 Dynamo, 45 lights, Toronto and Hamilton Electric Co. make. Used five months. Good as new. Box 195, Jordon, Ont. (R.T.F.)

FOR SALE — ONE (1) PLAIN LANDIS Grinder, 10" x 30"; In good working condition. Price reasonable. Apply Canada Forge Co., Welland, Ont. (20)

FOR SALE—2—16 x 2 POWER FEED TURrets; 1—16 x 1½ Turret with threading attachments; 1—16 x 2 Turret; 1—16 x 8 Engine Lathe; 1—12 x 8 Tool Lathe; 1 Speed Drill. Apply J. A. Harvey, 16 Pearl St. (21)

FOR SALE—GARAGE IN GOOD WHEAT district. Snap for a good, practical man. About forty cars in vicinity. Will sell cheap if taken at once. Address Box 74, Hanley, Sask. (13)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London, Ont.

AUTOMATIC SCREW MACHINES

Three (3) Gridley, single spindle, 2⅛" cap., motor drive, including motors, each $1500

Five (5) No. 2 Brown & Sharpe, each $500

Hartford, 2¼" cap. $850

Hartford, 1½" cap. $750

THE CO-OPERATIVE USED MACHINERY COMPANY

50 Church Street - - New York

Suite 482 Telephone Cortlandt 665

FOR SALE

FOUNDRY AND MACHINE SHOP WITH stove patterns and stock. Splendid opening. Apply Mrs. Thomas Johnston, Kemptville, Ont. (23)

1—C.G.E. TYPE 10—20 H.P. INDUCTION Motor—60 cycles, 220 volts, 45 amps.—1200 R.P.M., complete with Auto Starter. Pulley on Motor 12" Diam. x 10" Face. Cummer-Dowswell, Ltd., Hamilton, Ont.

FOR SALE—ONE NEVER-USED WESTINGhouse Motor, Type CCL, 5 H.P., 200 Volts, 16 Amperes, 3 Phase, 3000 Alts., 700 R.P.M., full load, equipped with starting compensator and frame and 6" pulley with 5" face. Canadian Machinery, Box 189. (16)

FOR SALE — TWO GOLDIE-McCULLOCH Wheelock Engines—cylinders 16" diameter, 38" stroke; both engines now running, but will be replaced with Hydro-Electric. Engines guaranteed to be in perfect condition, and will be sold complete with belt wheels, one 14' x 35" face and one 12' diameter with 24" face, also belting if required. Canadian Consolidated Felt Co., Berlin, Canada. (19)

FOR SALE OR RENT—MACHINE SHOP AND foundry, with garage. Good machinery, good locality. Lots of cars and boats. Power and rent very cheap. Box 334, Carleton Place, Ont. (21)

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double bandsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

ELECTRODES — THE PROPRIETORS OF letters patent No. 127080, relating to "Process of manufacturing iron for use in alkaline accumulators," and No. 127081, relating to "Active masses for positive electrodes of electric elements, etc.," desire to dispose of the patents or to grant licenses to interested parties at reasonable terms, with a view to the adequate working of the patents in Canada. Inquiries to be addressed to the actual proprietors, Svenska Ackumulator Aktiebolaget Jungner, Stockholm, Sweden. (13)

SITUATIONS WANTED

CHIEF ENGINEER — 26 YEARS' EXPERIence. Factory and Central Station, Alternating and Direct Current, Gas or Steam Engines, efficiency guaranteed, own instruments, best of references. Box 181, Canadian Machinery. (12)

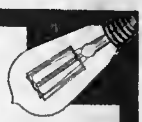
AS MAINTENANCE ENGINEER OF FACTory, power or lighting plant, where economy is a factor, wide experience, best of references. Box 180, Canadian Machinery. (12)

FOR SALE

Fox Monitor Lathe, 18" x 5' 6", 9-hole turret, cross feed, hollow spindle, 5-step cone; good as new. Plating dynamo, 6 volts, 250 amp.; used only a short time.

PENDRITH MACHINERY COMPANY
970 Queen St. West, Toronto (15)

WANTED



Burned out Tungsten Lamps, late type, drawn wire, 25, 40, 60 and 100 Watts, 110 and 115 volts.

DOMINION TUNGSTEN LAMP FACTORY
ST. CATHARINES, ONTARIO

REPAIRING

ALL KINDS OF MACHINERY REPAIRED, rebuilt and installed. W. H. Sumbling Machinery Co., 643 Yonge Street, Toronto, Ont.

SITUATIONS VACANT

WANTED—YOUNG MAN TO HANDLE ADvertising of a line of engineering equipment. Must be prepared to locate in a city of 15,000 population. Salary to start, $70 per month. Box 184, Canadian Machinery.

WANTED—FIRST-CLASS BOILER MAN TO take charge of battery of water tube boilers, 1200 H.P., which will be increased. Should be familiar with steam engine and air compressor. Reply, giving particulars of experience and salary expected. Box 191, Canadian Machinery. (19)

MECHANICAL SUPERINTENDENT WANTed—for plant of the Starr Manufacturing Co., Limited, Dartmouth, Nova Scotia (near Halifax), operating one 10-inch and one 18-inch train of rolls, producing merchant bar iron. Manufacturers of ice skates and bolts and nuts. Address the company direct, stating age, experience, salary required, giving references, also when services will be available. The Starr Manufacturing Co., Limited, Dartmouth, N.S. (22)

WANTED

WANTED BERTRAM WAVING ATTACHment for 4.5 Shells, with or without Lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson Limited. (R.T.F.)

WANTED—HYDRAULIC PUMP, GOOD FOR 2,000 lbs. pressure capacity for 16" diameter cylinder press; belt-driven preferred. Canadian Consolidated Felt Co., Ltd., Berlin, Canada. (18)

ENGINEER WANTS AGENCIES FOR MONTreal and district. Side line or specialties, on commission basis. X.Y.Z., Canadian Machinery, Montreal. (19)

WANTED — BERTRAM WAVING ATTACHment for 4.5 shells, with or without lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson, Limited, Hamilton, Ont. (rtf)

BOILERS WANTED—TWO SECOND-HAND, about 150 H.P.; at least 80 pounds working pressure under Ontario Government Boiler Regulations. Give full particulars, Box 198, Canadian Machinery. (19)

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, MAY 25, 1916 No. 21

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 22 Royal Bank Building, Telephone Garry 2313.
GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.
UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1101-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.
SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

Export and Trade Expansion Number

May 25th 1916

SECTION OF THE HARBOR OF MONTREAL, QUE., LOOKING SEAWARD.

Data Relative to Foreign Trade, Commerce and Transport

Compiled and Selected

When we consider the number and variety of metal-working plants that have either sprung into existence or have been materially extended as a result of war orders more or less varied and large, and when thought is given to the certain eventuality that this business will one day sooner or later cease, nothing is more natural than that the minds of those responsible for the maintenance and development of our commercial and manufacturing activities, should be exercised in the endeavor to seek new opportunities while simultaneously cultivating more intensely the old. It may be said that the latter is quite normal with respect to the former.

A PERUSAL of these editorial pages will convince the most skeptical that the foundations of a great industrial future for Canada have been well and truly laid. As in the past, and more than likely for all time to come, our agricultural achievement will, however, figure largely in our rate of progress towards a foremost place among the commercial nations of the world. The reclamation of our mineral wealth and the judicious conservation of our forest resources will each contribute their no insignificant quota in the direction indicated.

Canadian manufacturers have, so to speak, found their feet, as a result of war-made opportunities right to their hand, by which we mean that they have become alive to their capacity for doing things, and, in consequence, have developed an expertness that was aforetime believed non-existent, and still much less appreciated as being simply latent. Their business sense has been quickened and their outlook broadened, being just comprehensive enough now to manufacture competitive lines of commodities here in Canada to meet the requirement of any or every corner of the globe; distance being no drawback.

Such an attitude is "catching," but meantime intensely so, hence we find live municipalities within our borders awake to the new opportunities for plant establishment and location which manufacturing production to export or foreign order will create. It is a sign, further, that our citizens individually and as a whole are equally enthusiastic in the matter of our commercial and industrial development as are our manufacturers.

The Russian Feature

No attempt has been made in these pages to give undue prominence, much less to glorify the prospects of export business between Canada and any particular country, unless exception be made as to Russia, yet, in her case, the data given will be found to embody little more than a statement of conditions existent, which have been verified over and over again from the most trustworthy sources. Russia of all countries of the world has, of her own initiative, and seconded by the efforts of people well informed as to her requirements, made her trade opportunities more widely known to her nation friends than has any other Allied or neutral country in which German commercial influence predominated, and through which German manufactured products found a ready market. As a result, agency and enterprise have undoubtedly been directed more towards her than to others.

Not only, then, have we an organization whose activities are concerned wholly with war-created export demands from all quarters, and who are represented in Russia by one of her native-born sons who has been resident in Canada for a number of years and who has travelled abroad extensively, but we have had in addition the benefit of the activities of the staff of our Department of Trade and Commerce at Ottawa. Our business men have further been privileged to hear Russia's commercial possibilities discussed in a straightforward and comprehensive way by exporting and shipping representatives who in the past have been and are now in the closest possible touch with the Russian commercial situation. In a word, the needs of Russia are perhaps best known, and, therefore, the opportunities for Canadian manufacturers are perhaps the best available just at the particular moment.

From an industrial standpoint the descriptive articles in this issue covering our mineral and lumber resources, our

steel production, and our manufactures of steel and wood commodities therefrom; our harbor, port and navigation facilities and aids, indicate clearly that we possess natural material and locational advantages. The enterprises featured are, however, but representative of many others of a like kind and of an even more varied nature. In the realm of steel-making, mention may be made of the Steel Company of Canada, with its plants at Hamilton, Fort William, Belleville, Brantford, Gananoque and London, Ont., and at Montreal and Lachine, Que.; also of the Dominion Steel Corporation, Sydney, N.S., with which is incorporated the Dominion Coal Co., etc.; and of the Algoma Steel Co., at Sault Ste. Marie, Ont.

Shipbuilding

In the sphere of shipbuilding and marine engineering, in addition to Canadian Vickers plant on the St. Lawrence, we have the Davie Drydock and Shipbuilding Co. at Levis, Que., while on Lake Ontario we have the Kingston Drydock and Shipbuilding Co., the Polson Iron Works, Toronto, the shipyards and drydocks of Muir & Sons, and M. Beatty & Sons at Port Dalhousie and Welland, Ont., respectively. On our Upper Lakes—Superior and Georgian Bay, the shipbuilding plants of the Western Drydock & Shipbuilding Co., and of the Collingwood Shipbuilding Co., have the distinction of being capable of building the largest lake vessels afloat. On our Pacific Coast, shipbuilding and ship repair plants of varied capacity are to be found, while, as a result of the new conditions arising out of the war and the projected service to be afforded by the Panama Canal, steps are being taken to secure a further increase in establishment, as well as a Federal Government subsidy for the substantial support of the whole.

General Engineering

Other directions in which Canadian industrial and manufacturing enterprise has made special headway are those of freight car and locomotive building, heavy marine and other purpose steel casting and forging production, heavy and powerful hydro-electric and its kindred mechanical equipment, electrical instrument and specialty work, machine tool and accessory apparatus, also steam power plant main and auxiliary engines, boilers and contributory mechanisms, agricultural machinery of wide and varied application, etc. In view of the foregoing it will be noted that Canada is particularly well equipped to develop now an export trade on a competitive basis with all or any of the older manufacturing countries who in times past have catered to the requirements of those less favored in the matter of industrial resources and facilities.

A considerable export business has already been established between Canada and different countries abroad through the activities and enterprise of individual firms and corporations, and through the medium of the Export Association of Canada. This has consisted of locomotives, freight cars, raw, semi-finished and finished materials of construction and general engineering, embracing wire nails, belting, twist drills, wire rods, barbed wire, marine forgings, machine tools, steel billets, lumber, textile products and numerous miscellaneous products for general and domestic utility.

It has not been possible within the scope of the space available to us, to feature as comprehensively as we had desired, the various considerations to be accounted by our manufacturers in prosecuting an export campaign, or the variety procedure to be followed in the conduct of an export business. Sufficient has been said in these directions to serve as a guide, however, meantime. It cannot be too strongly emphasized that success in creating a market for our products, is wholly dependent on our attitude to the prospective consumer. The success of Germany in appropriating so much of the world's trade in the past was due to her all-consuming desire to give each national unit not only what it wanted at a price, but in the way it was wanted. By making this maxim or series of maxims the basis of their operations, there is little fear of failure in such efforts as our manufacturers may put forth to mix freely in a world-wide commerce. A knowledge of the language of the particular country to which export effort is directed, is also a very essential feature, which leads us to suggest that wherever possible the export manufacturer should have at least one member of his staff a more or less expert linguist.

We are indebted to the Montreal Harbor Commission for the cuts and data forming the article on Canada's Port Facilities, etc., and to the Exporters' Encyclopedia for the concise statements covering prevailing export and shipping customs and practices.

WEIGHTS AND MEASURES IN INTERNATIONAL TRADE

FUTURE developments in foreign trade will involve a wider use of the metric system of weights and measures, which is in almost universal use in all countries outside of the British and Russian Empires. The necessity of using systems other than avoirdupois, imparts more than a passing interest to data of this nature, especially at this time.

So far as all ordinary commercial purposes are concerned, the United States and British measures of length and weight, of the same denomination may be considered as equal, but the liquid and dry measures of similar denominations vary widely in the two countries.

Theoretically, the standard measure of length of both countries is the length of a pendulum vibrating at intervals of one second, at sea level in the latitude of London, suspended in a vacuum and at a temperature of 62 deg. Fahr. The length of such a pendulum is supposed to be divided in 39.1393 equal parts, called inches, 36 of these inches forming the standard yard of both countries. However, when the Parliamentary standard was destroyed by fire in 1834, attempts to restore it by measuring a pendulum proved futile.

Yard and Meter

The present British Imperial yard, as determined at a temperature of 62 deg. Fahr. by the standard preserved in the Houses of Parliament, is recognized as standard throughout the country and in the government departments of the United States, although not so declared by Act of Congress.

The meter, which is the unit of length of the metric system was intended to be one ten-millionth part of the earth's quadrant or the distance from either pole to the equator. This length was measured, and a set of standards prepared which rest in the archives at Paris. Although errors in the original calculations for determining the length have been discovered, the standards remain as originally prepared.

BRITISH AND METRIC EQUIVALENTS

Measures of Length

1 metre=39.37 in. or 3.28083 ft.
.3048 metre=1 ft.
1 centimetre=.3937 in.
2.54 centimetres=1 in.
1 millimetre=.03937 in. or 1-25 in. nearly.
25.4 millimetres=1 inch.
1 kilometre=1093.61 yds. or .62137 mile.

Measures of Weight

1 gram=15.432.
.0648 gram=1 grain.
28.35 gram=1 ounce avoirdupois.
1 kilogram=2.2046 pounds.
.4536 kilogram=1 pound.
1 tonne or metric ton=
.9842 ton of 2240 pounds
1000 kilograms
2204.6 pounds
1.016 metric tons=
1016 kilograms=
1 ton of 2240 pounds.

RUSSIAN WEIGHTS AND MEASURES AND THEIR ENGLISH EQUIVALENTS

Weights

1 dolya=0.6856 grain.
1 zolotnik (96 dolyas)=0.15 oz.
1 lot (3 zolotniks)=0.45 oz.
1 funt (96 zolotniks)=0.9 pound.
1 pood (40 funts)=36 pounds.
1 berkovetz (10 poods)=360 pounds.
1 oz.=6.65 zolotniks.
1 pound=1.108 funt.
1 ton=62.02 poods.

Measures of Length

1 vershok=1.75 in.
1 arshine (16 vershoks)=2 ft. 4 in.
1 sazhen (3 arshine)=7 ft.
1 verst (500 sazhens)=3,500 ft.
1 English yard=
0.4286 sazhen
1.286 arshines
1 English mile=
1.509 versts.
754.29 sazhens.

MARINE INSURANCE

THE shipper can arrange to have his insurance to attach from the time his goods are receipted for by the vessel — either sail or steam — or her agents, and to continue the risk after discharge at port of destination until delivered to the consignee; but this arrangement must be specially made, because the ordinary policy of insurance covers the risk only when the goods are actually laden, and terminates with discharge of the goods at port of destination. Should the vessel on which the goods are shipped be diverted from her voyage to an extent that the voyage is considerably extended (as, for instance, through the closing of the Panama or Suez Canals), shippers should make certain that their shipments are covered by their marine insurance policies for the extended voyage. Exceptional risks which are not incorporated in the policy may be provided for; this also must be a matter of special agreement when making the insurance.

It is assumed that, unless specified to the contrary, all goods are shipped "under" deck; therefore, when goods are shipped "on" deck, it must be so stated in the application for insurance. Goods laden on deck are insured free of claim for damage arising from exposure to the elements.

The ordinary policy of insurance excludes claims for damages or what is termed "particular average" on certain classes of goods, such as grain, etc. When it is desired to insure such goods subject to "particular average" it must be specially provided for in the application for insurance.

Free of "particular average" under 5 per cent. means that no claim for partial loss or damage will be allowed by the insurance company unless the actual loss or damage amounts to 5 per cent. or more of the amount for which the shipment has been insured, as set forth in the policy.

In marine insurance, the amounts recoverable as a total loss if not declared, i.e., under an open policy, are: For "merchandise," the prime cost, including the expense of shipment and the premium and charges of insurance; for the ship, its value at the outset of the voyage, including the outfit, stores, and provisions for the crew, their advance wages, and the premium and charges of insurance; for freight, the gross amount of freight expected, together with the premium and charges for insurance. As a claim for total loss cannot extend beyond the full amount insured in the policy, the documents required to substantiate such a claim must be supplied to the underwriters free of charge. These documents are:—(a)—protest; (b)—set of bills of lading (endorsed, if necessary, so as to be available to the underwriters); (c)—policy or certificate of insurance (endorsed, if necessary); (d)—assignment of interest to the underwriters. This last document is of considerable value in the event of salvage refunds in the case of salved goods, as any claim for salvage expenses will be sent direct to the underwriters.

DISTANCES IN NAUTICAL MILES

THE distances given in nautical miles indicate the shortest practicable routes when steaming from New York (the Battery), and are those furnished by the Hydrographic Office, Washington, D.C.

Destination	Nautical Miles
To Quebec	1321
" Charlottetown, P.E.I.	832
" Halifax	596
" Portland	349
" Boston	305
" Philadelphia	235
" Baltimore	404
" Newport News	281
" Charleston	627
" Savannah	700
" Key West	1128
" New Orleans	1711
" Mobile	1658
" Puerto Mexico	1944
" Colon	1974
" Habana	1186
" Saint Thomas	1434
" San Juan (P.R.)	1407
" Port Castries (St. Lucia)	1747
" Barbades	1829
" Georgetown	2217
" Pernambuco	3698
" Bahia	4089
" Rio de Janeiro	4770
" Montevideo	5757
" Buenos Ayres	5871
" Punta Arenas (Sandy Pt.)	6947
" Fastnet (Winter season)	2776
" Fastnet (Summer season)	2903
" Queenstown (Winter season)	2840
" Queenstown (Summer season)	2967
" Liverpool (Winter season)	3071
" Liverpool (Summer season)	3198
" Bishop's Rock (Winter season)	2907
" Bishop's Rock (Summer season)	3016
" Plymouth (Winter season)	3006
" Plymouth (Summer season)	3115
" Havre (Winter season)	3165
" Havre (Summer season)	3274
" Gibraltar	3219
" Fayal	2098
" Funchal	2765
" Las Palmas	2965
" St. Vincent	2914
" Bermuda	681

SIGNIFICANT!

RICHARD MARTENS, vice-president and managing director of the shipping and engineering firm of R. Martens & Co., Inc., sailed from New York, May 15, on the Anchor Liner California for Petrograd. During his six months' stay in the United States he has completed the organization of his American Company, has studied the manufacturing situation and has addressed gatherings of prominent merchants and manufacturers in important trade centres. A number of American engineers will join Mr. Martens in Petrograd in June for a conference, after which they will tour Russia and ascertain in what form consumers will be able to use American products. These engineers, in the past six months have visited important plants and have prepared reports indicating what American manufacturers are now ready to sell to Russian buyers.

RE-OPENING OF THE PANAMA CANAL

WHILE the re-opening of the Panama Canal to vessels drawing up to 30 feet of water has just been announced, there is every indication, says the New York "Journal of Commerce," owing to the difficulties experienced by shipping when the waterway was closed to traffic last fall, that the use of the canal will not be resumed on a normal basis for some months to come.

The confidence which was once felt in the canal was destroyed by that experience, and with the services of vessels at their present high value, representatives of steamship companies say that they are naturally hesitant to place themselves in a position where a repetition of the delays with attendant money losses, even if traffic were only temporarily suspended, would be possible. The consequence is that those companies which depended for the maintenance of their service on the Panama Canal will not resume immediately, but will wait until the canal has been tested.

Lines which will send their ships through the canal at once are those maintaining services where the use of the canal means merely a shortening of the voyage. In this class are companies operating vessels from Atlantic ports of the United States to the west coast of South America. The temporary suspension of traffic would work great hardship on these lines, because of the delay in taking the longer course and the necessity to provision ships differently unless the canal is used, but the saving in expense is such as to warrant running the risk.

SUPPLY OF CREOSOTE

THE supply of creosote, because of its use in preserving railroad ties, telegraph poles, and other timber employed on railways is a matter of considerable moment. It will, therefore, be of interest to know that, according to statistics published by the Bureau of Foreign and Domestic Commerce, the amount of creosote imported into the United States fell from 48,839,020 gallons in 1914 to 34,432,028 gallons in 1915, a decrease of 34 per cent. Owing to the average value per gallon having increased from 6.2 cents to 7.8 cents, the imports only decreased 11 per cent. in value. In 1914 33,873,173 gallons came from the United Kingdom, 9,861,996 from Germany, 3,868,786 from Belgium, 777,662 from the Netherlands 3,000 from Sweden, and 454,430 from Canada. In 1915 only four countries were concerned in the supply —the United Kingdom with 31,695,587 gallons, Germany 5,527 gallons, Canada 2,680,809 and Japan 50,105.

ITALY AND THE METRIC SYSTEM

AT a meeting of the London, England, Chamber of Commerce recently, Baron Qaaranta Bernardo di San Severino, a well-known commercial man from Italy, discussed some phases of the commercial relations between the United Kingdom and Italy. Without hesitation he criticized quite frankly the antiquated methods of British commerce, which unfortunately had driven the Italians against their will, to take advantage of the modern and enterprising system of German commercial penetration in Italy.

Lord Southwark, who presided, said that trade after the war with Italy would be of the greatest importance to both countries. When this terrible war was over it was their wish that the United Kingdom and Italy should remain life-long commercial friends. Since the war had commenced the London Chamber of Commerce had done much to bring buyers and sellers together in the two countries. In past years a great deal of Italian trade had slipped past England, and that was really due to the fact that they had no good trading banks. He believed, however, that a new arrangement between Lloyds' Bank and the London County and Westminster Bank was going to meet the difficulty in that respect.

Frank Criticism

The Baron said that he thought English goods were even too much sought after these days in Italy. There was a positive craze for everything English; and yet English goods were steadily disappearing from the Italian market, and German and Austrian goods had inundated the whole country. One of the first reasons for that was the low price of German goods. Another difficulty was the way in which England continued to employ its antiquated system of weights and measures, while Germany used the metric system. British firms also made the mistake of using the English language in their communications.

Another trouble, said the Baron, is that English exporting firms obstinately insist upon selling in Italy not what the Italians want, whether what they ask for be pretty or ugly, in good taste or in bad taste, but "what the English consider the Italians ought to want." The Germans, on the other hand, having made a long and profound study of our habits and customs, and of our needs, which are constantly increasing in proportion with the increasing prosperity of our country, not only provide us with what we want, but keep in constant touch with even our most eccentric caprices, which they are ready to satisfy no matter what strange forms those caprices may take.

The English, on the contrary, who have never troubled themselves to study our markets, have never been able to free themselves from their traditional conservatism, which is so injurious to their commerce. They insist upon imposing their own will and tastes on the purchaser, invariably forgetting that it is, after all, the buyer and not the seller who is the sole arbitrer of the situation, and they rigidly oppose, therefore, any suggestion of modification, however slight, in the articles of which they presumably wish to dispose. Italy is now set upon putting an end to the inoculation of Pan-Germanism; and a decree has been issued only a month ago in Italy with the object of putting an end to all German commerce in Italy. The moment has arrived when a great impetus ought to be given to British exports to Italy.

H. L. Symonds, who proposed a vote of thanks to the Baron, said that all British commercial men felt how absurd it was to retain the old system of weights and measures for modern business. At the same time, British business had not proved so bad in the past. In fact it had financed the whole war.

A. Barton Kent, in seconding, thought that Germany got her hold on Italy by penetrating the country with the German banking system, which showed more sympathy and support for traders than the British system. He referred to the scheme of a channel tunnel, of which he had always been a strong advocate; a scheme which would greatly help British and Italian trade, and which would, he thought, have been of immense use to us if it had been completed before the war.

E. R. Bartley Denniss, M.P., Liverpool, said that in Great Britain, where a population of forty-six millions had to be kept alive, foreign trade was of the first importance. The coming conference at Paris would discuss the best way of keeping that foreign trade going, but he did not believe the delegates had yet formulated any plan, or that the cabinet knew what its representatives were going for. It was their duty to urge upon the Government some common policy for after the war trade between the Allied Powers, and they ought to act on that at once. After the war they ought to be in a position to finance Italy as Germany had done, and take the place which Germany had occupied. Such a plan would be very much to the advantage and profit of British traders.

WIRELESS STATIONS, QUEBEC AND MARITIME PROVINCES

Stations	Range
Belle Isle	250 miles
Pt. Amour	150 "
Pt. Riche	250 "
Harrington	150 "
Heather Pt.	250 "
Cape Ray	350 "
Fame Pt.	350 "
Clarke City	250 "
Father Pt.	250 "
Grindstone Is.	200 "
North Sydney	100 "
Cape Bear	150 "
Pictou	100 "
Glace Bay	3000 "
Sable Is.	300 "
Camperdown (Halifax)	250 "
Cape Sable	250 "
Partridge Is. (St. John)	250 "
Grosse Isle	100 "
Quebec	300 "
Three Rivers	150 "
Montreal	200 "

MACHINERY MARKET IN ARGENTINA

THE Bureau of Foreign and Domestic Commerce, Washington, D.C., have published the report prepared by Special Agent J. A. Massel relating to the markets for machinery and machine tools in Argentina. Mr. Massel discusses the predominant position secured in the past by certain of European nations, especially Germany, and sets forth the causes that gave rise to that condition. He points out specially the methods that have been effectual in this field, and, with those as a basis, he formulates what he regards as a practical and desirable plan for increasing American trade. The monograph contains many descriptions of machines and tools actually in use in the countries mentioned.

BUSINESS WITH HONG KONG.

THE following statement is from the London and China Telegraph:—Hong Kong is affected by the order prohibiting Manchester and other places from continuing to supply goods to German firms in China. These goods, remarks the Colonial Gazette, are sold with a German trade mark or "chop," and the natives have got used to them. The position is that the articles have to a very large extent been made in Great Britain, but have been handled by German firms—an arrangement which has been to the benefit of both parties. Unless the British firms can now step in and establish direct connections, the Germans will no doubt obtain some goods from neutral sources and continue to mark them with their brands, but it will not be easy to do so, and very high prices will have to be paid. The breaking up of the old combination will create a new situation, and it is to be hoped that British merchants in Hongkong will use it energetically in their own interests and those of British trade.

LIABILITY OF STEAMSHIP COMPANIES

THE liabilities of a steamship company are defined by special Act in force, as a rule, in most commercial and industrial countries. In general, this Act declares, among other things, that "if the owner of any vessel transporting merchandise or property to or from any port in the country to which the Act applies, shall

exercise due diligence to make his vessel in all respects seaworthy and properly manned, equipped and supplied, neither the vessel, her owner or owners, agent or charterers, shall become or be held responsible for damage or loss resulting from faults or errors in navigation or in the management of said vessel; nor shall the vessel, her owner or owners, charterers, agent or master be held liable for losses arising from damages of the sea or other navigable waters, acts of God or public enemies, or the inherent defect, quality of vice of the thing carried, or from insufficiency of package, or seizure under legal process, or for loss resulting from any act or omission of the shipper, or owner of the goods, his agent or representative, or from saving, or attempting to save, life or property at sea, or from any deviation in rendering such service."

The statute applies to coastwise shipping as well as to shipping between domestic and foreign ports. The carrier is still liable for damage arising from negligence in loading, stowage or the proper delivery of the cargo. As to other matters, it is bound simply to supply a seaworthy boat and officers and crew chosen with reasonable care. For negligence of officers and crew in navigating the vessel the owners are not liable.

TRADE INQUIRIES

THE following inquiries relating to Canadian trade have been received by the Department of Trade and Commerce, Ottawa. The names of the firms making these inquiries, with their addresses, can be obtained on application.

398—Iron and Steel Bars and Steel Plates.—A Glasgow firm desires quotations, c.i.f. Glasgow.

401—Mild Steel Billets and Blooms for Rerolling.—Quotations wanted, c.i.f. Glasgow, for shipment May and June.

402—Annealed Wire—A Glasgow firm are in the market to purchase annealed wire, baling and other qualities. Quotations c.i.f. Glasgow, for shipment May and June.

403—Bars, Plates, Sheets.—A firm in Glasgow wishes to receive quotations from Canadian exporters of iron and steel-finished materials, such as bars, plates and sheets, etc.

404—Bars, Sheets, Plates, etc.—A Glasgow firm asks to be put in touch with Canadian exporters of finished iron and steel in bars, sheets, plates, hoops, wire, etc.

405—Bolts, Nuts, Rivets, etc.—A Glasgow house desires to hear from Canadian manufacturers of iron and steel manufacturers, such as bolts, nuts, rivets, nails, etc., c.i.f. Glasgow.

407—Wire Nails.—A Glasgow house wishes to receive quotations from Canadian firms.

DELIVERY OF GOODS

ALL goods should be delivered to the steamer in the name or for account of the shipper who has contracted for the freight room, or in whose name the shipping permit has been arranged. The said permit should be presented either with the goods, or to the steamship company's clerk at the receiving pier before delivery is made. Goods that are to be shipped "in bond" should not be delivered until the steamer on which they are to be shipped is at her loading berth.

SHIPPING THROUGH FORWARDING AGENTS

DURING the war in Europe the services of the forwarding agent and freight broker are invaluable. Being right on the spot and in constant touch with the steamship companies, they are able to obtain for shippers the current freight rates (which are liable to sudden fluctuations); to arrange for freight room on outgoing steamers, prepare the bills of lading, consular invoices and other documents for a nominal charge, and attend to the details connected with transferring the shipments from railroad cars to alongside steamer or dock. The Exporters' Encyclopedia, published by the Exporters' Encyclopedia Co., Maritime Exchange Building, 78 Broad Street, New York, will enable the shipper to check the routing, consular charges and other expenses with which he is billed, thus insuring him against errors. The forwarder occupies a very responsible position toward the shipper, and great care should be used in the selection of responsible concerns.

Manufacturers who consign their goods to a forwarding agent or a steamship company for shipment must comply strictly with the regulations of the country for which the shipment is destined, as to marking, weighing, packing, etc., and should advise their agent as to the number and character of the packages forwarded, the marks and numbers (if any) on same; the weights, both gross and net (in pounds or kilos, as the regulations may state), the nature of the contents of every package and the value of the different kinds of goods; whether to consign "direct" or "to order"; whether to affect insurance (stating the amount); whether or not to prepay freight and change (if optional); also what disposition to make of the bills of lading and consular invoices (if any), when issued.

The shipper should always send to his forwarding agent the "original" railroad bill of lading, as otherwise the latter may not be able to identify the goods when notified of their arrival by the railroad company, thus incurring delay in shipment and, possibly, storage charges.

WIRELESS STATIONS, ONTARIO PROVINCE

Stations	Range
Kingston	300 miles
Toronto	300 "
Port Burwell	300 "
Point Edward (Sarnia)	300 "
Tobermory	300 "
Midland	300 "
Sault Ste. Marie	30 "
Port Arthur	300 "

WIRELESS STATIONS, BRITISH COLUMBIA, YUKON AND ALBERTA

Stations	Range
Prince Rupert	250 miles
Dead Tree Pt. (Queen Charlotte Is.)	150 "
Ikeda Hd.	250 "
Triangle Is.	350 "
Estevan Pt.	500 "
Paschena Pt.	300 "
Victoria	250 "
Pt. Grey (Vancouver)	150 "
Cape Lazo (Comox)	300 "
Alert Bay	300 "

PRICES OF COKE, BAR IRON AND STEEL IN BRITAIN

THE British Ministry of Munitions has issued the accompanying list of maximum prices on coke, bar iron and steel to be adhered to by producers in Great Britain:

Coke.

	Per ton net f.o.t. Makers' Ovens £	s.	d.
Durham:			
Blast-furnace coke	1	8	0
Special blast-furnace coke, guaranteed under 0.008 of phosphorus	1	10	6
Foundry	1	10	6
South Yorkshire, West Yorkshire, North Staffordshire, North Derbyshire, South Wales	1	4	0
Blast-furnace coke	1	10	0

Maximum Prices of Steel.

	Per ton f.o.t. Makers' Works £	s.	d.
Angles, ordinary sizes	11	2	6
Joists	11	2	6
Ship-plates	11	10	0
Boiler-plates	12	10	0
Rails (railway)	10	17	6
Sheet and tin-plate bars	10	7	6
Billets, ordinary mild steel	10	7	6
Billets, special	11	0	0

All plus usual standard extras.

Dar Iron.

	Per ton net f.o.t. Makers' Works £	s.	d.
South Staffs:			
Standard quality, ordinary sizes and merchants lengths	13	15	0
Marked bars (less 2½%)	15	0	0
South Yorkshire:			
Standard quality, ordinary sizes and merchants lengths	13	15	0
North of England:			
Standard quality, ordinary sizes and merchants lengths	13	15	0
Lancashire:			
Standard quality, ordinary sizes and merchants lengths	13	15	0
Scotch Bar Iron:			
Standard quality, ordinary sizes and merchants lengths	13	15	0

All subject to the usual extras for special sizes and qualities.

These prices are not intended to apply to sections rolled by manufacturers who do not make their own steel or puddled bars, and have to purchase blooms, billets, or puddled bars from other sources.

High-Speed Tool Steel

The maximum prices for high-speed tool-steel have been fixed as follows:—Finished bars, 14 per cent, tungsten, 2s. 10d. per lb. basis; ditto, 18 per cent.

tungsten, 3s. 10d. per lb. basis; usual trade extras for special sizes, etc. These prices are net delivered buyers' works.

The fixed prices for scrap, which must be returned to steel-makers' works, are as follows:—Millings and turnings, 5d. per lb. net, delivered steel-makers' works: bar ends, 6d. per lb. net, delivered steel-makers' works.

It should be added that these maximum prices have been fixed until June 30, 1916, and thereafter until further notice, and further, that the makers may sell for delivery after June 30, 1916, on the understanding that the fixed maximum prices ruling on the first day of any month during the period of the contract will apply to all deliveries made during that month. Those maximum prices are based upon the abnormal costs and conditions now prevailing, and must not be assumed to be indicative of any difference in relative values which may have obtained in the several districts before the war, and may obtain again after the war. This intimation must not be taken to authorize any sale or purchase or other dealing prohibited under the Defence of the Realm Regulations.

EXPLANATION OF COMMERCIAL TERMS

C. F. OR C. A. F. (Cost and Freight), means that the seller furnishes the goods and pays the freight—no other expenses, to place of delivery as agreed, all risks while goods are in transit being for account of the buyer.

C. i. f. (Cost, Insurance and Freight), means that the seller furnishes the goods, pays the freight and insurance to point of delivery, all other risks while goods are in transit being for account of the buyer.

F. o. b. destination, means that the seller pays all costs and assumes all risks until the goods reach the place of delivery as agreed.

F.o.b. steamer, means that the seller is to deliver the goods aboard the steamer in proper shipping condition, all subsequent risks and expenses being for account of the buyer.

F. a. s. steamer, means that the seller is to deliver the goods alongside steamer on lighter, or on the receiving pier of the steamship company in proper shipping condition, all subsequent risks and expenses are for account of the buyer.

TARIFFS INSUFFICIENT TO MEET TRADE COMPETITION

PREFERENTIAL tariffs, technical education, recruiting methods and preparedness for industrial progress by Canada after the war were the chief topics discussed at the recent annual meeting in the Board of Trade building of the Toronto branch of the Canadian Manufacturers' Association. W. C. Coulter, the retiring Chairman, in his address declared the complete and final suppression of the German menace will be achieved only when it is placed beyond the power of Germany to recover the trade temporarily lost. The products of the Central powers should be subject to such surtax and other disabilities as would effectively restrict their competition with the markets of the Allies. He also alluded to the system of taking eligible men for the colors regardless of the part they play in the economic field, and maintained that a national register was the only proper method, no matter from what viewpoint regarded.

More Efficiency Needed

S. R. Parsons of the British Imperial Oil Co., also favored the Allied Nations working hand in hand in a commercial way, but stated that while they might talk about preferential tariffs, if they relied on tariffs only they would rely on a broken reed. These things were well and good, but he thought they should fit themselves to take their places in the world of industry by the efficiency of their methods. Technical training was important in this respect. As regards the demands of recruiting he said he did not think they would mind that so much if they felt the right kind of men were taken, but they did not want to see the experts taken and the loafers left about town. He believed there should be more businesslike methods in regard to recruiting.

J. P. Murray remarked that reference had been made to protection against German competition. He thought the incoming Executive might give their attention to what might be expected from the United States, who were right at Canada's door, and would leave no stone unturned to get all the trade they could.

Twenty-Two Firms Quit

The report of H. Macdonald, Acting Secretary, stated that twenty-two firms in the membership went out of business mainly owing to unusual trade conditions. The Toronto branch membership now stands at 713 firms and corporations, a reduction of twenty-four, which might be explained by a membership campaign having had to be temporarily postponed owing to other work demanding the attention of the executive staff. The expenditures from the general revenue of the Association for branch purposes during the year amounted to $1,658, a decrease of $120 over the corresponding period of last year. The classification of membership indicates a revenue receivable from the territory allotted to the branch of $13,760, being a decrease of $140 on the previous year.

SAILING DISTANCES—NAUTICAL MILES, PACIFIC COAST

From	To Vancouver	To Victoria
Aberdeen	M 14,680	M 14,600
Adelaide	7,753	7,673
Aden	10,727	10,647
Amsterdam	M 14,439	M 14,359
Antwerp	M 14,403	M 14,323
Auckland	6,205	6,125
Barbados	M 12,228	M 12,158
Belfast	M 14,327	M 14,247
Bombay	9,536	9,456
Bordeaux	M 14,053	M 13,973
Bristol	M 14,208	M 14,128
Buenos Ayres	M 8,336	M 8,256
Calcutta	8,719	8,639
Cape Town	M 11,017	M 10,937
Cardiff	M 14,188	M 14,108
Cherbourg	M 14,143	M 14,063
Colombo	8,586	8,506
Copenhagen	M 14,830	M 14,750
Dundee	M 14,663	M 14,583
Genoa	S 13,530	S 13,450
Gibraltar	M 13,351	M 13,271
Glasgow	M 14,409	M 14,329
Grimsby	M 14,467	M 14,387
Halifax	M 13,770	M 13,690
Havana	M 13,774	M 13,694
Havre	M 14,212	M 14,132
Hongkong	5,800	5,720
Hull	M 14,479	M 14,399
Leith	M 14,657	M 14,577
Liverpool	M 14,317	M 14,237
London	M 14,363	M 14,283
Madras	9,721	9,641
Malta	S 13,060	S 12,980
Marseilles	S 13,630	S 13,550
Melbourne	7,347	7,267
Montevideo	M 8,276	M 8,196
Montreal	M 14,490	M 14,410
Naples	S 13,237	S 13,157
Newcastle	M 14,567	M 14,487
Plymouth	M 14,100	M 14,020
Port Said	S 12,124	S 12,044
Quebec	M 14,355	M 14,220
Rangoon	8,167	8,087
Rio de Janeiro	M 9,214	M 9,134
Rotterdam	M 14,415	M 14,335
St. Johns (Nfld.)	M 13,707	M 13,627
Shanghai	5,230	5,170
Singapore	7,089	7,009
Southampton	M 14,193	M 14,113
Sunderland	M 14,554	M 14,474
Swansea	M 14,170	M 14,090
Sydney	6,848	6,768
Valparaiso	5,938	5,858

Vancouver	...	82
Yokohama	4,280	4,200
Zanzibar	11,144	11,064

M—Via Strait of Magellan.
S—Via Suez Canal.

SHIPPERS' DRAFTS—FINANCING OF EXPORTS

WHEN a shipper is to draw on consignee for value with documents, he should consign the goods on both the "bills of lading" and the consular invoices (when such are required), to "order" and having endorsed the full set of both documents, "in blank" they should be presented with his draft (arranged in duplicate) and certificate of insurance to the banker through whom collection is to be made. When the foreign buyer has no open credit, the shipper should fix prices in foreign currency. Drafts on Europe should be made out in the currency of the country on which drawn. The banker through whom a draft is to be collected should always be instructed under what conditions the documents are to be surrendered—that is, whether they are to be delivered upon "acceptance of draft" or only after "payment of draft." Unless instructed to the contrary, unpaid or unaccepted drafts will not be "protested."

Despite the lack of Canadian banks abroad it is not so difficult to arrange foreign credits as many manufacturers suppose. The agencies of foreign banks here are in a position to collect money against consignments in most countries of the world. The endorsement of the bank with which a Canadian manufacturer does business will enable the latter to obtain practically the same accommodation from these foreign bank agencies as is granted to the manufacturers in Europe.

Until Canadian banks are established abroad it will be necessary to transact the business through these foreign bank agencies, and it would be to the advantage of the Canadian manufacturer to become better acquainted with the facilities that now exist.

BILLS OF LADING

THESE should be arranged on the steamship company's blanks and the description of the goods should correspond exactly with the receipts issued by the company to the shipper. These receipts should be attached to the "bills of lading" when the latter are presented to the company for signature. The "bills of lading" should be made out in exact accordance with the requirements of the steamship company. Bills of lading will not be signed until the prescribed form of "Shippers Export Declaration" is in the hands of the steamship company. "War tax" stamps are not required on ocean bills of lading.

HEAVY PACKAGES

UNLESS otherwise stated it is understood that the freight rates quoted by steamship companies apply to packages not exceeding 2 tons weight. When packages exceed this weight provision must be made by the shipper either to put the pieces aboard the steamer through direct arrangement with a hoisting company or to arrange with the steamship company for freight rates to include the hoisting charges. Similar extra charges are liable to be made at the post of destination or at transshipping points, so that shippers should be careful to find out when shipping heavy pieces just what the freight rate covers.

PACKAGES MARKED "FRAGILE"

SHIPPERS should appreciate that it is quite useless to mark in English only, such expressions as "handle with care," "this side up," etc., on packages intended for foreign countries where English is not spoken or understood by those who will handle the freight. If any such instructions are necessary, they should be stated in the language of the country for which they are destined, as well as in English.

FREIGHT RATES

CONTINUAL fluctuations make it impossible to indicate any standard freight rates. Some shipping companies issue freight tariffs, showing rates for different classes of freight to their ports of call, but as these tariffs are always subject to change without any notification, it is advisable to apply directly to the companies or to responsible freight bookers for rates at time of shipment, always indicating the weights, cubic measurement, and character of the merchandise. During the war in Europe, freight rates are liable to violent fluctuations, owing to the scarcity of neutral tonnage, liability to seizure, etc.

While the freight rate on ordinary cargo is based on either weight or measurement, what is called "special cargo," such as revolvers, jewellry, boots and shoes, and goods of an unusual value according to bulk, have always to pay an 'Extra Rate', based on a small percentage of the value, in addition to the regular freight rate. This extra change is made because of the necessity of special storage for its protection. In some cases cargo of this character is delivered specially to the Captain personally, and is placed under the care of the purser or some other responsible officer of the ship. The extra rate may vary anywhere from one per cent. to three and one-half per cent. of the value of the shipment. Sometimes, the extra charge is made on the basis of so much extra per 40 cubic feet, and sometimes on the basis of so much ad valorem, whichever produces the most revenue for the steamship company.

SAILING DISTANCES—NAUTICAL MILES—ON ATLANTIC COAST

From	To Halifax	To Montreal	To Quebec
Aberdeen	2,529	2,765	2,630
	S	S	S
Adelaide	12,105	12,626	12,491
	S	S	S
Aden	5,968	6,491	6,356
Amsterdam	2,795	3,317	3,182
Antwerp	2,759	3,281	3,146
	H	H	H
Auckland	11,634	12,254	12,219
Barbados	1,909	2,715	2,580
Belfast	2,361	2,645	2,510
	S	S	S
Bombay	7,618	8,141	8,006
Bordeaux	2,647	3,169	2,034
Bristol	2,462	2,977	2,842
Buenos Ayres	5,701	6,421	6,286
	S	S	S
Calcutta	9,260	9,783	9,648
Cape Town	6,423	7,108	6,973
Cardiff	2,442	2,957	2,822
Cherbourg	2,514	3,036	2,901
	S	S	S
Colombo	8,060	8,583	8,448
Copenhagen	3,003	3,239	3,104
Dundee	2,586	2,822	2,687
Genoa	3,519	4,042	3,907
Gibraltar	2,671	3,194	3,059
Glasgow	2,408	2,693	2,558
Grimsby	2,823	3,345	3,210
Halifax	...	872	737
Havana	1,620	2,475	2,340
Havre	2,680	3,102	2,967
	S	S	S
Hongkong	11,046	11,569	11,434
Hull	2,835	3,357	3,222
Leith	2,613	2,849	2,714
London	2,719	3,241	3,106
	S	S	S
Madras	8,609	9,132	8,997
Malta	3,656	4,179	4,044
Marseilles	3,361	3,884	2,749
	S	S	S
	12,413	12,936	12,801
	C	C	C
Melbourne	12,393	12,916	12,781
Montevideo	5,586	6,306	6,171
Montreal	872	...	135
Naples	3,641	4,164	4,029
Newcastle	2,923	3,445	3,310
Plymouth	2,035	2,944	2,909
Port Said	4,571	5,094	4,959
Quebec	737	135	...
	S	S	S
Rangoon	9,263	9,786	9,651
Rio de Janeiro ...	4,611	5,331	5,196
Rotterdam	2,771	3,293	3,158
St. Johns (Nfld.)..	540	1,025	890
	S	S	S
Shanghai	11,789	12,312	12,177
	S	S	S
Singapore	9,606	10,129	9,994
Southampton	2,540	3,062	2,927
Sunderland	2,910	2,897	2,762
Swansea	2,424	2,923	2,788
	S	S	S
Sydney	12,896	13,419	13,284
	C	C	C
	12,858	13,381	13,246
	M	M	M
Valparaiso	8,200	8,920	8,785
	M	M	M
Vancouver	13,770	14,490	14,355
	S	S	S
Yokohoma	12,508	13,031	12,896
	S	S	S
Zanzibar	7,688	8,211	8,076

S.—Via Suez Canal. C.—Via Cape Town. H.—Via Cape Horn. M.—Via Straits of Magellan.

INAUGURATION OF NEW ELEVATOR EXTENSION

IMMEDIATELY following the successful launch of the new ice-breaker "J. D. Hazen," from the shipyard of Canadian-Vickers at Longue Point, on the afternoon of May 15, and graced by the presence of the same distinguished party of invited guests, the $800,000 addition to Montreal Harbor Commissioners' Elevator No. 1, was formally opened. The ceremony took place on the mezzanine or sacking floor, Lady Borden giving the signal which set the machinery in motion and opened a bin valve, thereby permitting a continuous stream of wheat to fall on the moving conveyor belt underneath. In so doing she inaugurated the full activity of what is now the largest seaport elevator in the world, the new addition giving elevator No. 1 a total capacity of 4,000,000 bushels.

Starting-up Function

The machinery was started by means of two small flags, of which the staffs were covered with insulated copper. By crossing these and thus connecting the copper ends Lady Borden established a current which gave a signal down in the power room. The power room immediately answered by clanging a gong, and men stationed at the proper points through the building threw in the machinery clutches. Lady Borden then opened the bin valve and the elevator was in operation. Those present next walked over to the huge dray elevator near Shed 3, and were lifted to the second floor, where an enjoyable collation awaited them.

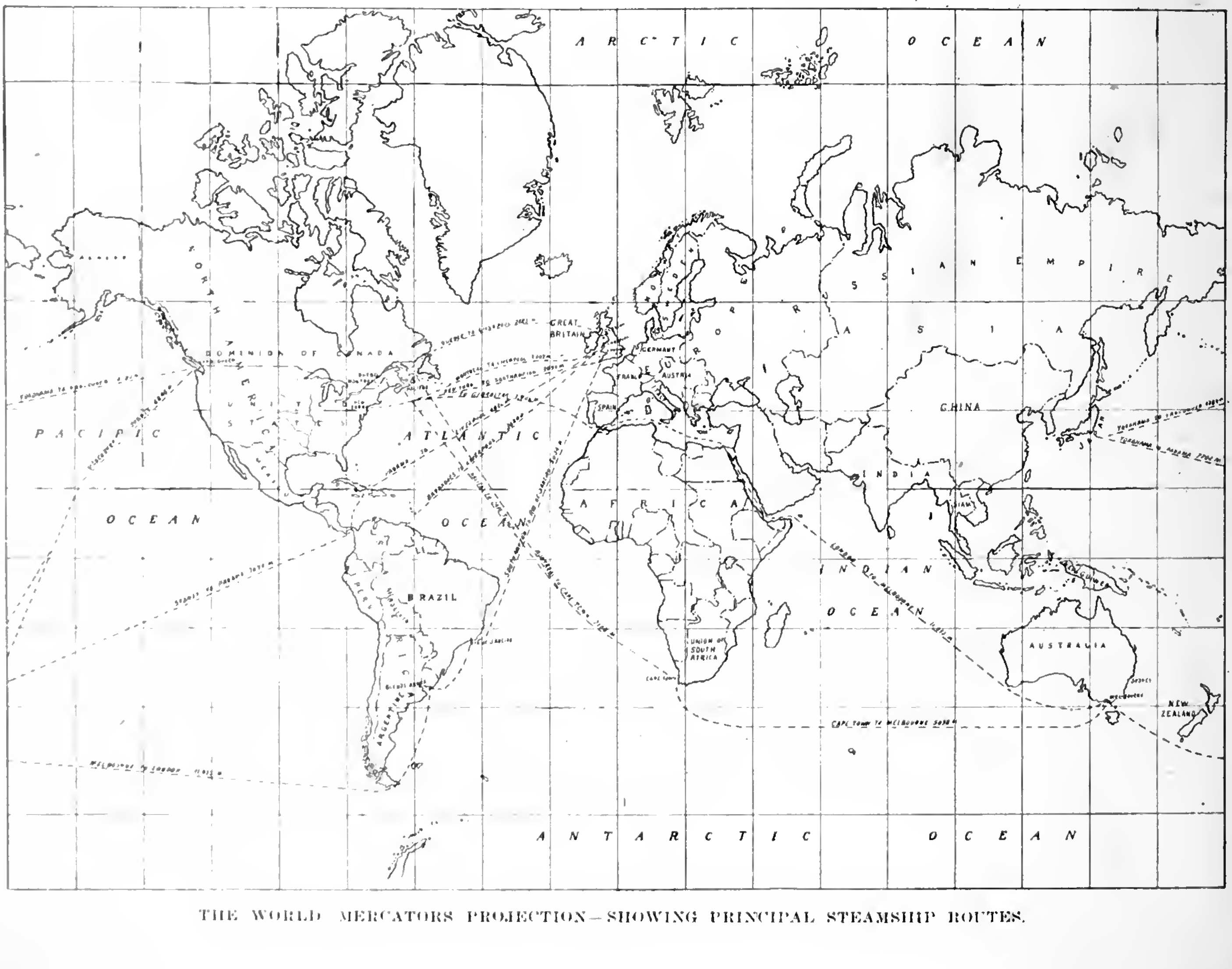
Presentation to Lady Borden

Here W. G. Ross, chairman of the Montreal Harbor Commission, addressed Sir Robert and Lady Borden, Lieutenant-Governor LeBlanc and Mrs. LeBlanc and the other guests. At the end of his address the occasion was signalized by the presentation to Lady Borden, by Mrs. W. G. Ross, of a magnificent silver tray with a striking representation of the new elevator engraved on it, together with the following statement:—"Presented to the Right Honorable Sir Robert Laird Borden, P.C., K.C.M.G., K.C., LL.D., Prime Minister of Canada, and Lady Borden, on the occasion of the opening of the extensions to Grain Elevator No. 1, Harbor of Montreal, Fifteenth May, 1916, by the Harbor Commissioners of Montreal, William G. Ross, President Farquhar Robertson, Brig.-General A. E. Labelle."

Mr. Ross stated in his address that the building would stand as one of the many monuments to business industry through the country. The contract for the extension, called for completion on July 15 next, but it had been completed two months ahead of time and at a cost about ten per cent. under the estimates. Grain from the elevator could be poured into the hold of any ship at its own berth in the greater portion of the harbor, and it could unload the largest lake steamer in 3½ hours after its arrival. It could fill the largest grain ocean-carrier in seven hours.

The harbor facilities had developed very quickly from the time 10 years ago when half a million bushels made almost the total amount of grain handled. In 1914 Montreal handled more grain than any other seaport of North America, and already this year before navigation opened 5,000,000 bushels were dealt with, most of it being bagged and shipped by cars to St. John and Halifax. During the winter 41,152 cars were handled on Harbor Commissioners' railway, twice the number of any previous winter.

After Mrs. Ross had presented Lady Borden with the silver tray for the Harbor Commissioners, His Honor the Lieutenant-Governor of Quebec, expressed his



THE WORLD MERCATORS PROJECTION—SHOWING PRINCIPAL STEAMSHIP ROUTES.

pride and pleasure at being present on the important and historic occasion.

Transportation Problems

Sir Robert Borden expressed his pleasure at seeing such development in the Port of Montreal as he had witnessed on his trip to the Canadian Vickers, to be present at the launching of the new ice-breaker. In connection with the launching he had been speaking of the industrial development of Canada, but the basic industry of Canada was agriculture, and the prosperity of Canada had to be built upon it. Her agricultural production could be immeasurably increased yet. Only one-tenth of the available fertile area of the West had been scratched, and the possibilities of expansion there confronted the Government with the pressing need of adequate transportation for the crops by water and by land, so that the grain would be taken in the most economical and efficient manner to the markets of the world.

Canals and railways were needed, and last, but not least, the development of the great national ports of Canada. He was pleased to be present at the opening of the greatest tidewater elevator in the world, and to see what he had seen. He prophesied a phenomenal development for the port in the next quarter century and he promised the cooperation of the Government of Canada for every reasonable purpose to secure the development needed. In Montreal what had been done was only the beginning of the great work intended in the future.

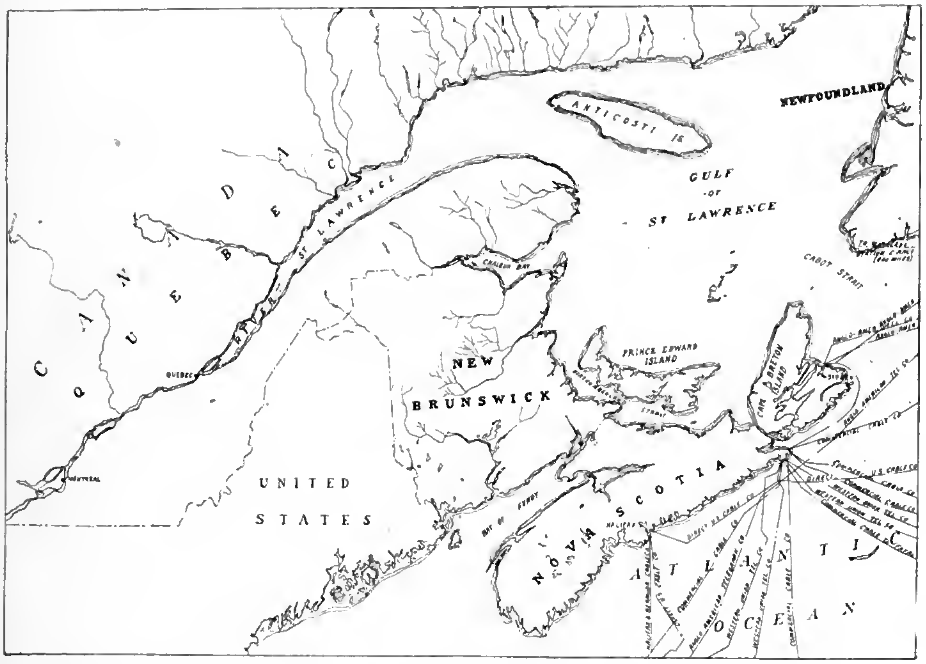


DIAGRAM SHOWING OCEAN CABLE STATIONS IN MARITIME PROVINCES.

OCEAN FREIGHT RATES

OCEAN rates are basel on prompt acceptance, usually by wire, and unless so answered are void as to contract, except by special agreement. As steamship agents always base their calculations on cubic contents, be careful in asking rates on bulky or measurement goods, like machinery of all kinds, to be explicit as to weights and measurements. Mark and number each package, and be sure the invoice tallies with the shipment. If you desire shipment insured, say so in your advice to the steamship company or forwarder, otherwise it is taken for granted that these details have been attended to by the shipper or his representative.

Send your advice to the steamship company or forwarder promptly, so they can have the necessary time between arrival of shipment at port of exportation and departure of steamship to complete details.

Ocean rates are quoted as a rule in sterling with primage to be added. The following table shows in what space the usual export commodities stow:—

Gross Ton	Stowage Cubic ft.
Apples	90
Bacon	65
Beef	50
Butter	70
Cotton, pressed	130
Cotton, unpressed	200
Cheese	70
Flour in sacks	55
Wheat in bulk	48
Peas	45
Corn in bulk	50
Hops	260
Lard	65
Leather	120
Oilcake	46
Oats	72
Oil	60
Ore	18
Pork	50
Resin	60
Syrup	44
Tallow	65
Machinery	65 to 250

SHIPPING RECEIPTS

WHEN steamship companies require any special form of receipt, blank forms should be obtained from them. If no special receipt is required, any ordinary form of receipt is sufficient. The marks and numbers (if numbered) on the packages should appear on the receipts, which should be arranged in duplicate, and the contents of the packages should be correctly described. The word "merchandise" should not be used. All receipts must be arranged in the name of, or be endorsed to, the party to whom the "bills of lading" are to be issued, and are returnable to the steamship company when "bills of lading" are issued.

DONALDSON LINE SS. "ATHENIA," TYPICAL OF CANADIAN OCEAN SERVICE.

Shipping Facilities at Canada's Principal Ocean Ports

Staff Article

Events of the past two years have amply demonstrated the ability of this country to contribute largely to the world's trade in manufactures as well as produce. Had the war not intervened, the marine activity of various ports would have materialized to a much greater extent than they have, but the present rate of development of industry and agriculture promise to tax even all projected developments to their full capacity in a few years.

DURING the season 1915 there arrived in the port of Montreal 815 sea-going vessels, with a tonnage of 2,261,374 tons. In view of the conditions prevailing in regard to maritime commerce such an amount of shipping must be considered very satisfactory, as, despite the requisition and retention by the British Admiralty of large portions of fleets regularly plying to this seaport, the tonnage mentioned is but 14 per cent. less than in 1914, which was 2,755,518, while a number of vessels dropped 101 from 916, or about 11 per cent.

This reduction in tonnage was doubly unfortunate for Montreal, as the phenomenal grain crop of that season, most of which would under normal conditions have passed through this port, was diverted to other channels. Such an occurrence is recognized as being due entirely to the existing state of hostilities in various parts of the world, and in due course the port of Montreal will again resume its consistent growth as the premier seaport of the Dominion of Canada.

VIEW OF HARBOR OF MONTREAL AS IT APPEARED IN THE YEAR 1830.

Early Development

From 1865, when the ship channel between Montreal and Quebec was deepered from 16½ ft. to 20 ft., until 1888, when a depth of 27½ ft. had been attained, the burden of the waterway had been carried by the Montreal Harbor Commission, who had paid the interest on the entire capital cost out of the harbor revenues. At this stage the policy was adopted of classing the ship channel with canals and other navigational works, resulting in the channel with all its dredging plant and staff being taken over by the Department of Public Works of the Dominion.

Since that time the energies of the Harbor Commission have been devoted to the perfecting of facilities in the way of plant, equipment, trackage, warehouse and dock accommodation, with results which have had no small influence on the development of Canadian overseas trade.

Grain Elevators

Chief amongst the many interesting features of the port is the elevator accommodation. Prior to 1910 the export grain handling equipment in Montreal harbor consisted of a 1,000,000-bushel elevator owned and operated by the Montreal Warehousing Company ;two obsolete wooden elevators owned by the Canadian Pacific Railway, since torn down; and a fleet of floating transfer elevators of miscellaneous construction and varying age and efficiency.

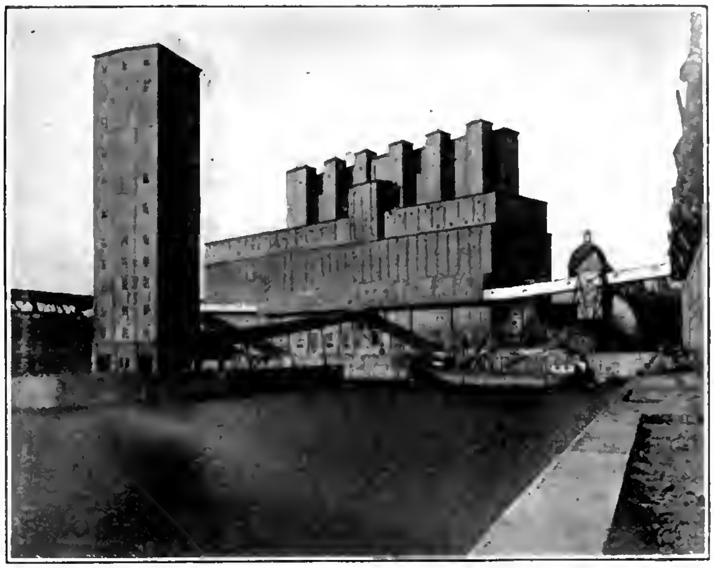
VIEW OF HARBOR OF MONTREAL IN 1872 SHOWING SAILING VESSELS.

Early in 1910 the Harbor Commissioners of Montreal determined to erect a new grain elevator of the highest class and most modern type, to have a capacity of 1,772,000 bushels, but in 1911 it was found that this extra storage room would be still insufficient to meet the needs of the port, and an extension was begun. The entire plant, known as Elevator No. 2, with a total capacity of 2,622,000 bushels, was put in operation in 1912.

The grain business increased so much as a result of the additional equipment that the construction of a 1,500,000-bushel addition to No. 1 Elevator was commenced in the spring of 1913, and was in operation at the beginning of 1915 season. Still another addition to No. 1 Elevator was required, and construction was started early last year on the completion of which the total capacity of the port will be:

No. 1 Elevator	4,000,000	bushels.
No. 2 Elevator	2,622,000	"
Grand Trunk Elevator	2,150,000	"

The full significance of such accommodation and the necessary equipment is realized from the following facts:



GRAIN ELEVATOR NO. 2 AND MARINE TOWER JETTY.

OCEAN GRAIN VESSELS LOADING AND WAITING FOR BERTHS. WINDMILL POINT.

Grain can be received from lake vessels and barges at the rate of 40,000 bushels per hour.

Grain can be received from cars at the rate of 36 cars per hour.

Grain can be delivered to ocean vessels at the rate of 75,000 bushels per hour.

Harbor Railway Terminals

The operation of the railway terminals has proved to be one of the most important and successful features of the development of the port of Montreal. These terminals extend from Victoria Bridge to Longue Pointe, a distance of seven miles, extending through the adjoining cities of Montreal and Maisonneuve, with a total track mileage of 44.9 miles. The matter of providing through railway connection from all parts of the harbor to all the trunk lines of the country began to receive attention in 1914, since when there has been remarkable development in the industrial business between manufacturing establishments on the water front, and the Canadian railways. As a result of the Commissioners' policy, coal, raw materials, supplies and manufactured goods are shunted into the industries, while manufactured goods and completed articles are shipped out to all points of the country on to the steamships in the harbor.

The rates charged for this service are so moderate, and the results so satisfactory, that an urgent demand has sprung up for immediate extension of the harbor terminals to new sites, and to the industrial wharves which are being specially constructed.

Shipbuilding and Repairing Facilities

Perhaps the most important factor in the development of the port, next to harbor accommodation, has been the provision of shipyard facilities for the prompt and efficient performance of repairs to either hull or engine. After a considerable amount of construction work, a site was prepared, which includes thirty acres of filled land for shipyard purposes with about six acres additional right-of-way for harbor tracks and roadway. The shipyard site is owned and operated by Canadian Vickers.

A prominent feature of the equipment is the "Duke of Connaught" floating

dry dock, which was built at the Barrow works of Vickers, and towed across the Atlantic in September, 1912. The maximum capacity of the dock, which is in three sections, is sufficient for docking ships up to 25,000 tons displacement, and up to 700 ft. in length. The value of such a unit as part of the port equipment is being increasingly recognized each year, a total of twenty-four vessels being docked and repaired during season 1915.

The shipbuilding berth is 500 ft. long, with a clear width of 116 ft. It is entirely enclosed so that work may be carried on continuously, despite the rigors of a Canadian winter. Engine and boiler shops, electrical construction department, with brass and iron foundries, enable repairs of any magnitude to be performed on vessels of all sizes and propelling machinery of any existing type, be it turbine, reciprocating, or internal combustion engines.

Safety and Insurance Aspects

Any reference to the port of Montreal would be incomplete did it not contain mention of the efforts made to insure the safety of navigation on the River St. Lawrence. While certain reductions have occurred since 1900, when the basis of rates at present in force was fixed, they still remain at a figure which is unduly high, having regard to the adequate dry dock accommodation in the river, the provision of which removed the last substantial argument against low insurance rates.

MONTREAL HARBOR, SHOWING SHEDS NO. 24 AND 25, ALSO RAILWAY TERMINALS JUST COMPLETED.

In November last an important conference was held between the Commissioners and representatives of British marine insurance companies, the discussion touching upon the great works of improvement accomplished by the Canadian Government through the Department of Marine and Fisheries, in deepening and widening the channel and establishing magnificent aids to navigation, and operating the signal service system, and all other means whereby the hazards of navigation in the St. Lawrence have been greatly lessened in the last few years. The degree to which such efforts have been carried will be understood from the fact that since 1900 Canada has spent $70,000,000 on the St. Lawrence route, the results showing up very clearly in the steady decrease in losses and accidents. The value of the St. Lawrence route to Canada's deep inland water connection with interior points was demonstrated during last season, when about 30,000 tons of nitrate of soda from Chile were transhipped at Montreal en route to the Western States, this being the only break in continuity over the entire distance of 10,500 miles. Among other features of note in the grain trade of Montreal during 1915 were the following: The shipment of 100,000 bushels of grain to New Zealand—the bagging of 2,800,540 bushels of grain at Elevator No. 2—the receipt of the first car of grain over the new Canadian Northern Transcontinental line, on Nov. 18, 1915—the receipt of the first car of grain over the Grand Trunk Pacific, the National Transcontinental Railway, and the Grand Trunk System on Nov. 25, 1915. These facts alone justify Montreal's claim to be considered the premier port of Canada.

DRY DOCK AND SHIP REPAIRING PLANT, CANADIAN VICKERS, LTD.

VANCOUVER, B.C.

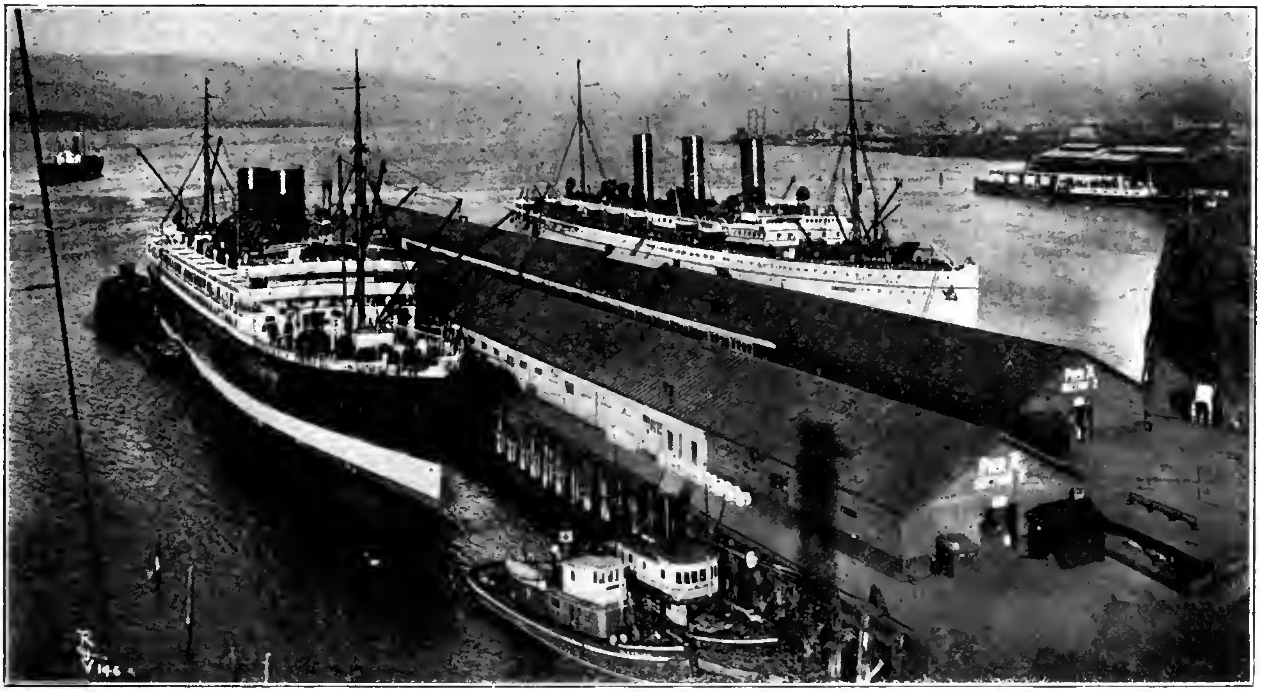
IN olden days, the harbor of Vancouver was described as the finest great harbor that indents the coast of British Columbia. Vancouver is the principal port of Canada on the Pacific coast and in addition to being the western terminus of the Canadian Pacific Railway is also served by the Great Northern line from Washington State, and the Canadian Northern Railway which recently completed its transcontinental line. Steamboat connection is provided by the Grand Trunk Pacific with Prince Rupert, the terminus of that railroad and the Pacific Great Eastern line of steamships also operates to the harbor.

The harbor is administered by a harbor commission with three members, empowered by an Act of Parliament, of May, 1913, and consists of an outer, central and industrial harbor. These are located a few miles northeast of the mouth of the Fraser River, the outer harbor stretching east and west a distance of six miles, by five miles wide, and connecting with the central harbor through the First Narrows which are from 35 to 72 feet deep at low water and about 500 feet wide. The central harbor is five miles long with a maximum width of two and a half miles, and is connected with the industrial harbor by the Second Narrows, 450 feet wide.

From the Second Narrows to Port Moody is a distance of about nine miles, the entire foreshore and navigable water forming part of the harbor of Vancouver. Already many industries are established on both shores, the location being conveniently situated with regard to shipping facilities, and adequate transportation facilities insure its future as Vancouver's manufacturing centre.

Some idea of Vancouver's potentiality as a port may be gathered from the fact that there are 98 miles of water front, nearly all of which is suitable for industrial and commercial purposes, with deep water and an almost entire absence of submerged rocks, shoals and other

VANCOUVER HARBOR, LOOKING UP, WITH C.P.R. NEW DEPOT IN FOREGROUND.



VANCOUVER HARBOR, SHOWING AUSTRALIAN AND ORIENTAL BOATS AT PIER "A."

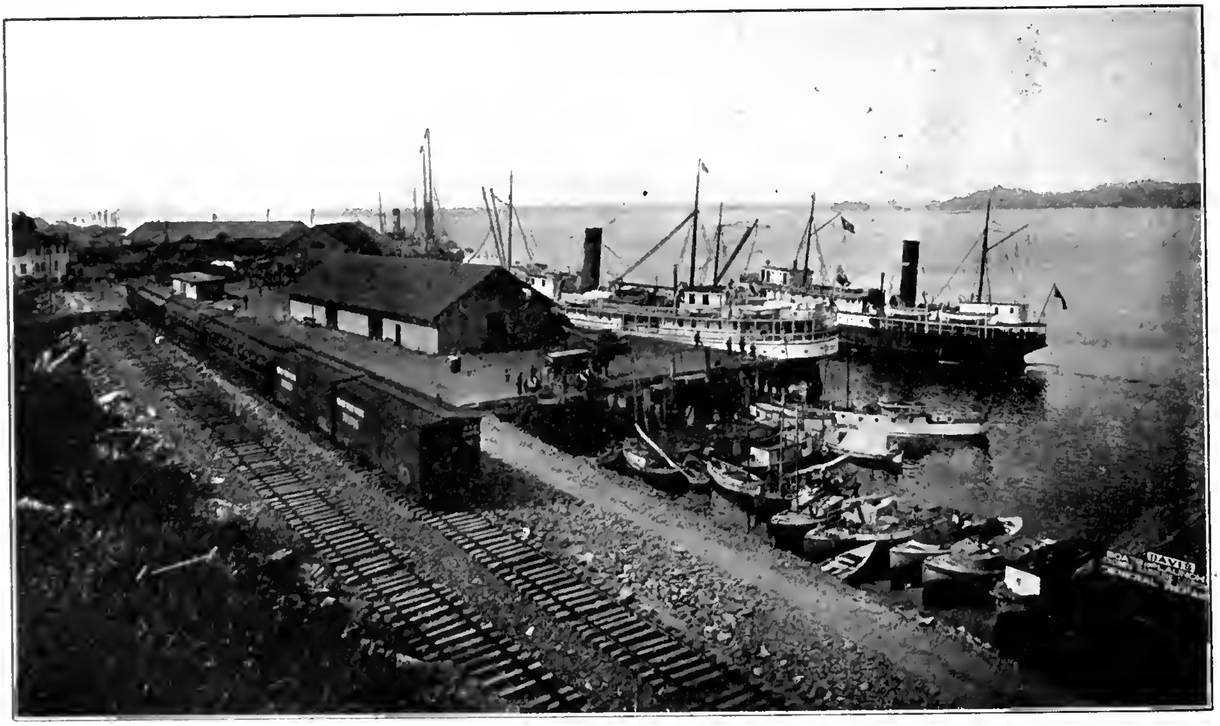
dangers to interfere with navigation.

Trade Capacity

Exports for the year ending March 31, 1915, amounted to 795,908 tons, consisting principally of lumber, fish and minerals. The shipping operations involved shipping arrivals totalling 7,668 coastwise vessels aggregating 3,305,458 tons and 1,463 foreign vessels aggregating 1,692,314 tons.

In normal times shipping facilities are of an ample nature; the Royal Mail steamers of the Canadian-Australian Line carry passengers and freight to and from the Antipodes on a 21-day schedule, the Blue Funnel boats, the largest freighters afloat, ply around the world, and a fleet of big vessels of the Andrew Weir Line, maintain a regular schedule between Vancouver and the Orient. Freight communication is provided between New York and Vancouver by a line of British vessels, and the Harrison Line, and a service to Antwerp places Vancouver in direct touch with the ports of Europe. The East Asiatic Co., the American Hawaiian Steamship Co., the Canadian-Mexican Pacific Steamship Co., the Pacific Coast Steamship Co., and many smaller shipping concerns are engaged in trans-pacific and coasting trade.

PRINCE RUPERT, SHOWING G.T.P. DRY DOCK AND SHIPBUILDING PLANT.



PRINCE RUPERT, SHOWING GENERAL VIEW OF HARBOR.

Future Developments

Provision for the future is under consideration, as is evidenced by the acquisition of an 80-acre site for a dry dock by a company subsidized by the Government. Among other improvements being carried out by the Govern-

ment is a reinforced concrete wharf, 800 ft. long with a frontage of 300 ft., and a depth of 35 ft. at low water. This wharf will be equipped with two sheds 800ft. long by 80 ft. wide, of the most modern type, and with up-to-date appliances for loading and discharging purposes, the operation of the plant being expected to devolve on the Harbor Commissioners.

A grain elevator recently completed has a total capacity of 1,250,000 bushels, receiving at 20,000 bushels per hour, and loading at 60,000 bushels per hour.

PRINCE RUPERT, B.C.

TEN years ago the site of Prince Rupert was little short of a wilderness of timber-covered land, the only means of ingress and egress being by boat. As the terminus of the Grand Trunk Pacific Railway it came into existence about eight years ago, and now has a population of 6,000 people.

A total wharf frontage of 1,685 feet has now been constructed and a floating dry dock with accessory plant enables general repair work to be undertaken on a large scale. When operated as a unit, the dry dock has a lifting capacity of 20,000 tons, which is the combined capacity of the two end units of 5,000 tons each and the centre unit of 10,000 tons. The accessory plant consists of foundry, boiler shop, machine shop, ship shed and carpenter's shop, with full equipment of cranes, power house, etc.

Prince Rupert occupies an excellent strategical position in regard to the Orient, being 500 miles nearer the East than any other terminus on the Pacific seaboard of the Dominion.

HALIFAX, N.S.

HALIFAX is situated on the Atlantic seaboard of the Province of Nova Scotia. It has a population of over 45,000 and possesses numerous industrial establishments in addition to being a Government naval station and the capital of the province. The favorable nature of the city's location in regard to supplies of raw material and distributing facilities in the shape of railway communication and shipping routes has been responsible for much of the manufacturing activity which prevails here.

Natural Advantages.

As an export point it enjoys considerable advantages in the matter of distance over other ports in the Maritime Provinces and in the United States. It is several days nearer Cape Town than New York is, and in normal times enjoys steamship communication with the leading seaports of Europe, South Africa, Australasia, West Indies, etc.

At the present moment construction is proceeding on new ocean terminals for the Canadian Government Railways. When completed there will be provided a passenger station building, abutting on a landing stage 2,000 feet long, the entire facilities of which will be devoted to the handling of passengers and their baggage, mail and express business, and ordinary cargo, the different classes of business being handled in rotation at specially equipped sections of the stage.

Future Developments.

The railway station accomodation is planned on a very complete scale with ample provision for handling large volumes of immigrant traffic. It is known as Halifax City Station and is designed to handle local passenger traffic in addition to steamship passengers.

Freight traffic is being taken care of by the erection of four new piers to replace smaller existing ones. The first of these was commenced in the fall of 1911, and was recently completed, having a length of 686 ft. and width 235 ft. The pier rests on 1,550 concrete piles, each 24 in. square, by 75 ft. long, this being the distance from rock bottom to track level at a height of 15 ft. 8 in. above extreme low water. The cost of the pier is approximately $690,000, while the building which is 677 ft. long by 198 ft. wide will cost about $333,000, not taking into account the cost of fitting temporary offices and rooms for use by officials, immigrants and regular traffic pending the completion of the railway station and passenger pier previously referred to.

VICTORIA, SHOWING GENERAL VIEW OF HARBOR.

VICTORIA, B.C.

THE capital of British Columbia is Victoria, situated at the southern end of Vancouver Island and having a population which advanced from 20,000 five years before to 65,000 in 1913. The principal industry is lumber, exports consisting chiefly of lumber, coal, whaling products, fish and fruits.

The entire dock development has been due to private enterprise, although a

Harbor Master, appointed by the Department of Marine and Fisheries is in charge of the movement of vessels in the port. Extensive developments are in progress at the present time including a 2,500 ft. breakwater and two large docks, the former sheltering a 90 acre area, while the latter will provide room for future traffic increase, having a berthing space of about 1,000 feet with a depth of 35 feet at low water.

Owing to the fact that most of the cargo is distributed throughout the island by coaster, the great bulk of the business is transferred direct from deep sea steamer to coaster, no railway connections are necessary at the wharves, local business being handled by motor transport from dock to destination.

Shipping Facilities.

Building and repair work is handled by at least five firms, one having a cradle 280 ft. long by 60 ft. beam which provides dry dockage for vessels up to 3,000 tons, and another having a cradle 150 ft. long by 35 ft. beam. Modern machine shops and foundries in various establishments enable marine repair work to be efficiently handled.

Esquimalt.

Four miles from Victoria is Esquimalt Harbor where the Government naval establishments are located. Here is located the yard of Yarrow, a branch of the well known British firm, in close proximity to which is the site of the new Government dry dock. This dock is to be proceeded with in the near future and will be 1,150 ft. in length, by 120 ft. in width, superseding the present graving dock of 480 ft. length which is not adequate for large boats berthing here for repairs.

ST. JOHN, N.B.

ST. JOHN, New Brunswick, is one of the busiest and most progressive of the Maritime cities of Canada. In furnishing troops, in manufacturing munitions, and in shipping grain and other supplies to Great Britain and the allies, St. John since the war began has done splendidly, eclipsing all previous records.

During the month of March, 1916, 109,225 tons of supplies were shipped through the Port of St. John to the United Kingdom and French ports. For the fiscal year ended March 31, 1915, the total value of exports through St. John amounted approximately to $45,000,000, as compared with $22,000,000 the previous year. For the fiscal year ended March 31, 1916, the total export values were $120,042,590, (an actual increase over the previous year of $76,169,658—a magnificent showing. The ocean tonnage through St. John in 1916 amounted to 179,361 tons, as compared with 82,143 tons in 1915.

The industrial plants of the city, including the lumber and pulp mills, cotton factories, sugar refinery, machine works, iron foundries, brush factories, nail plants, edge tool works, and leather factories, have been exceptionally busy. To some extent, these industries have been stimulated by war orders, but there are many in which the old lines are furnishing ample work. The manufacturing firm of T. McAvity & Sons have just broken ground for one of the largest iron and brass foundries in the lower provinces. The plant will be located in the eastern part of the city near the I. C. R. track. Under the agreement with the city the firm will have to spend at least $100,000 the first year. As the firm have contracts which must be filled by August, a very large portion of the works will have to be erected this year.

Harbor development work is proceeding at East St. John, and it is expected that the comprehensive scheme of development on the West Side, which was suspended soon after hostilities began, will be resumed this summer. There is a possibility of a revival of wooden shipbuilding as well.

St. John is looking for a big influx of immigrants after the war is over. The provincial government is preparing ready-made farms for these immigrants and for returned soldiers who may want to take up agricultural work. St. John was the first city in Maritime Canada to adopt the daylight saving plan, as it was the first to adopt the commission form of government and the town planning system. A plebiscite on the repeal of the commission form of government was recently taken, resulting in a larger vote in its favor than when it was first introduced.

When the Port of Halifax was opened, 1895-96, the total sailings for the season were less than one-half the sailings for the month just closed. Owing to the closing of the St. Lawrence River to navigation during the winter months considerable business accrues to both St. John and Halifax. The winter season extends from December 1 to April 30, and receipts for the season just closed amounted to $81,319.37, an increase of about 30 per cent. over 1914-15. During the same period sailings aggregated 206, an advance of 53 over last season.

CANADA'S TRADE

CANADA'S total trade for the month of April reached the remarkable total of $106,585,334, as compared with $65,221,031 for the corresponding period of the previous fiscal year. Being for the first month of the new fiscal years these figures seem to promise well for a record-breaking trade period. The increases are shown in both exports and imports. Merchandise entered for consumption amounted to $50,147,830, as compared with $28,391,640. These imports show a substantial increase in the free list as well as in dutiable goods, the free imports increasing from $11,776,319 to $21,218,746.

The grand total of imports, including coin bullion, amounted to $50,612,619, compared with $28,963,756.

Exports of foreign and domestic goods amounted to $55,372,720, as compared with $36,257,275 in the corresponding month of the last fiscal year. Exports of manufactured products increased from $13,221 658 to $21,573,078, and agricultural exports from $6,618.443 to $21,305,977. Mineral exports increased from $2,975,002 to $3,690,744, and forest exports from $1,929,440 to $2,287,939.

Another large increase is shown under animals and their produce, exports of which amounted in April, 1915, to $3,312,498, but which amounted in April of this year to $5,112,105.

DOMINION STEEL CORPORATION

THE president of the Dominion Steel Corporation, Mark Workman, accompanied by Wm. McMaster and W. G. Ross, has been at Sydney, N.S. looking over the steel and coal properties of the company. His visit was in connection with matters relating to the compilation of the yearly figures.

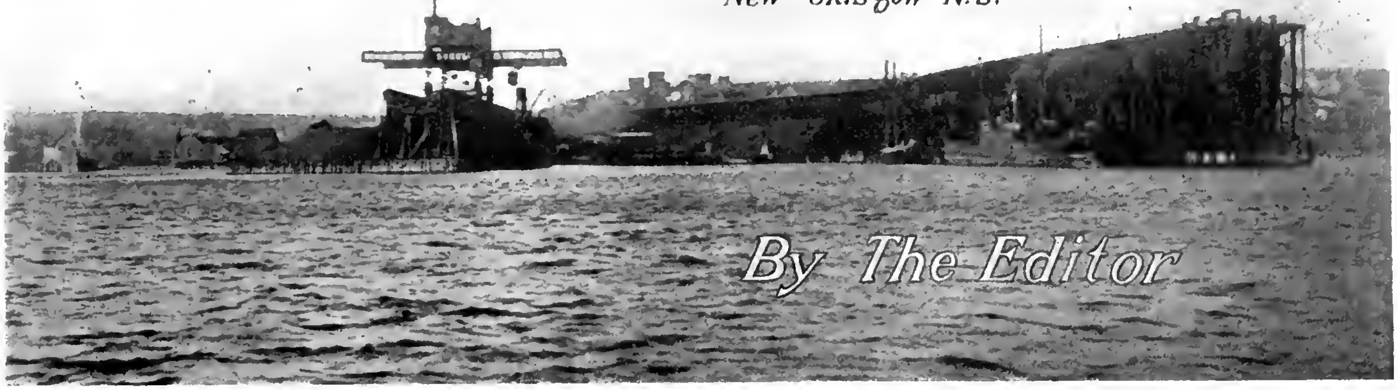
"I find there are a number of problems to be overcome," says Mr. Workman, when asked for a statement. "Our coal business is being handicapped by various difficulties, the chief of which is the fact that we have scarcely any steamer tonnage to transport the product of the mines. The Admiralty found it necessary to requisition the majority of our coal carriers for war purposes.

"Take Montreal, for instance; in normal times we would be shipping large quantities of coal up the St. Lawrence River at this season of the year, but under present conditions it is very difficult for us to fulfill our obligations with our customers in that district, among whom are many munition factories, which are now finding their output endangered from this cause.

"As regards the steel company," continued Mr. Workman, "we are hoping for a reasonable output of our products to offset as far as possible the increased cost of the necessary raw materials used in our various operations. Prices of supplies required for steel making purposes have advanced enormously since the outbreak of the war, and this in itself constitutes quite a difficult problem."

The Nova Scotia Steel & Coal Co.

Wabana Nfld., Sydney Mines and New Glasgow N.S.



The history of "Scotia" from its inception down to the present is a fascinating one, because full of life, energy and optimistic determination. In bringing Canada's coal, iron and steel industries to their present degree of successful achievement, the Nova Scotia Steel & Coal Co., it will be observed, has at no time been lacking in prominence of contributory effort.

AROUND the growth of the Nova Scotia Steel & Coal Co. and its parent organizations is woven in large measure the record of Canada's coal and iron industries' achievement.

The Coal Side

The history of the company down to the present—1916—dates back nearly three centuries to the time when Nicholas Denys, then Governor of Eastern Acadia, was granted certain concessions that included the whole of Cape Breton Island, one of the richest coal fields in the world. Although at that early day coal was known to exist at Sydney, this immense property was not systematically developed until the organization, in the early part of the nineteenth century, of the General Mining Association of London, England. The first shaft was sunk in 1830 and, from that time onward, coal mining in Cape Breton has been marked by a steady growth. In 1900, the holdings of the General Mining Association were taken over by the Nova Scotia Steel & Coal Co., in whose control the property still remains.

The Steel Side

Equally interesting as the coal feature is the story of the rapid growth of the iron and steel branches of this now great industry. Starting in 1872 with a capital of $4,000 and a working force of eight men, the little Hope Iron Works of New Glasgow quickly developed. Six years later, in 1878, a larger plant having become necessary, the whole undertaking was removed from the centre of the town of New Glasgow to a point two miles down the East River, then called Smelt Brook, but now known as Trenton or North New Glasgow. There was begun the manufacture of railway car axles. In 1882 it was decided to engage in the manufacture of steel, and the Nova Scotia Steel Co. was organized with a capital of $160,000, an increase in ten years to forty times the original capital. One year later a Siemens-Martin open-hearth steel plant was completed, and a 26-inch blooming mill installed—the first of its kind in Canada—together with a 22-inch plate mill. Two years later a bar mill was added. In 1889, the Nova Scotia Forge Co. and the Nova Scotia Steel Co. were amalgamated under the name of the Nova Scotia Steel & Forge Co.

COL. THOMAS CANTLEY, PRESIDENT AND GENERAL MANAGER.

The New Glasgow Iron, Coal & Railway Co. was organized in 1890 with a capital of $1,000,000. Extensive iron ore lands were purchased, including a valuable section on the East River, near Pictou, a line of railroad from Ferrona Junction to Sunny Brae was constructed and many other improvements made, the most important of which was the building of a large coal washing plant, coke ovens, and modern blast furnace at Ferrona.

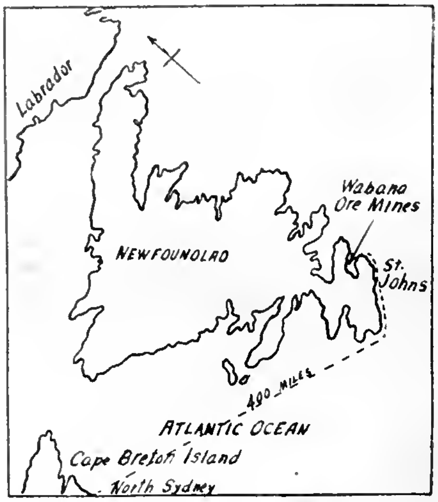
In 1894, the New Glasgow Iron, Coal & Railway Co. acquired the now famous iron ore deposits of Bell Island, Conception Bay, Newfoundland, and added a new name, Wabana, to the list of the world's shipping ports. The mines were opened up, machinery installed, and a double track ropeway, storage pockets and pier were constructed. The first shipment of ore was made on Christmas Day, 1895. Since then about 13,000,000 tons of ore have been shipped from Wabana.

Consolidation of Interests

The Nova Scotia Steel & Forge Co. and the New Glasgow Iron, Coal & Railway Co. were consolidated in 1895, the new concern being known as the Nova Scotia Steel Co. After the purchase in 1900 of the coal and other properties of the General Mining Association, the corporation now known as the Nova Scotia Steel & Coal Co. was formed.

Merged, therefore, in the latter are the companies that mined the first coal and smelted the first steel in Canada, and being first in the field, it is in a measure but natural to expect that no effort would be spared to keep right in the van of further development and progress. That such has been the experience, the record of continuous and substantial expansion and increased earning power makes amply evident, besides indicating careful forethought in administration and planning.

The whole trend of events in the evolution of the Nova Scotia Steel & Coal Co. has been relative to, and has taken cognizance of, the two essential elements making for national industrial greatness—i.e., coal and iron. Recognition besides of the unrivalled economic locations of the various plants in the matter of tidewater facilities for reaching the markets of the world on a low freight rate basis as well as of the ease with which Canada's domestic requirements could be catered to through the medium of railroad transportation have in no less degree been a determining factor.



NEWFOUNDLAND, SHOWING LOCATION OF WABANA ORE MINES.

Steel Making at Sydney Mines

Upon acquisition of the Cape Breton coal fields, and owing to the short water carriage from their Newfoundland ore mines, the company decided it was advisable to erect a new blast furnace and open-hearth plant near their coal mines, which are situated on Sydney harbor. In 1904 a new blast furnace and open-hearth plant were put into operation at Sydney Mines. To further improve the quality of their open-hearth product, in 1911 a Harmet fluid compression plant was installed in connection with the open-hearth installation. During the same year there were also added two steam hydraulic forging presses, one of 4,000 tons and the other of 600 tons.

UNLOADING IRON ORE FROM NORTH SYDNEY SHIPPING PIER.

Car Plant Established

To take care of the increased output in the most profitable manner, and to meet the growing demand for railroad cars in Canada and elsewhere, a subsidiary company was formed in 1912. This is known as the Eastern Car Company of New Glasgow, N.S., the control of which is vested in the Nova Scotia Steel & Coal Co.

"Scotia," as the company is more familiarly called, has now become one of the largest industries in Canada, as well as a very important world factor in the production of iron and steel. Five distinct industries are combined in its operation:

1—The Iron Mines at Wabana, Newfoundland.

2—The Coal Mines at Sydney Mines, N.S.

3—The Blast Furnaces and Smelting Works at Sydney Mines, N.S.

4—The Steel Works at New Glasgow, N.S.

5—The Car Works at New Glasgow, N.S.

Wabana—Island of Iron

The Wabana (Newfoundland) iron properties are the largest on this continent, if not in the world. Available reserves of ore, as estimated by experts, are between 2,000,000,000 and 3,500,000,000 tons, an amount which at present rate of mining will not be exhausted for more than 3,000 years. By comparison with the next largest holdings on this continent, those of the United States Steel Corporation (1,300,000,000 tons), an idea of the magnitude and great wealth of this Wabana field can be formed. Equally important is the excellent quality and richness of the ore, which is a fine grade of red hematite, averaging from 51 to 55 per cent. pure iron on all three seams worked.

Only in recent years was this valuable property discovered and developed, but just how attention was first attracted to the deposits is not known. Bell Island, the site of the Wabana deposit, is some six miles long by two miles wide, and is elliptical in shape, as its name signifies.

The property in any case eventually came into the hands of Messrs. Butler of Topsail, who, after vainly endeavoring to interest other capital in the venture, finally leased the deposit to the Nova Scotia Steel Co. in 1893. Two years afterwards that company commenced to mine the ore in a small way.

The work, at first, consisted entirely of openeut mining, the earth covering being stripped off the deposit as it lay in the ground and the ore carried by an endless rope tramway to a pier on the south side of the island. This pier was nothing more than a block set out some distance from the shore and connected with it by a suspension bridge. Later, however, this was supported by a trestle.

At first the ore was used solely to supply the Ferrona blast furnace of the Nova Scotia Steel Co., and large quantities were not required. The Wabana plant, therefore, consisted merely of a hopper pier of two thousand tons capacity, and the tramway. This, however, met all the requirements, for the mining was quarry work and did not need a more elaborate outfit.

Three years later the possibility of shipping ore to European markets called for an enlargement of the plant. Storage pockets were built, giving an increase of from twelve to fifteen thousand tons storage capacity. At the same time a horizontal ore conveyor was installed, tracks were laid, and a number of other additions made.

In the year 1899, work began in earnest. Twelve hundred men were employed during that season in mining from the old property and developing the new. Tramways were constructed and a new pier built, since when the "Scotia" Company has gone ahead producing ore without a single break.

For two years after opening this new bed, the ore was secured by stripping and quarrying the deposits lying near the surface . In 1902, however, work was commenced sinking two slopes on the land areas. Operations were carried on rapidly, and, within a year, the two mines had been opened up and were being worked in a manner similar to the bore-and-pillar method of coal mining.

INTERIOR OF CHANGE HOUSE, SUBMARINE PLANT, WABANA, NFLD.

Both these slopes were sunk to a considerable height above tide-water and one of them was driven so as to come out on the shore above high water mark, thus forming an adit. The other slope, Scotia No. 2, was destined eventually to be driven under the sea.

Developing the Submarine Areas

About the year 1905 the possibilities of developing the submarine areas began to attract the attention of the "Scotia" Company. Further additions to its under-water holdings were secured, making the total of submarine property held approximately 35 square miles.

After deciding to drive a couple of slopes to the submarine fields, an arrangement was entered into with the Dominion Iron & Steel Co. for piercing their section which divided the Scotia fields. Work on this began in May, 1906, and in two and one half years the feat was accomplished, the "Scotia" Company entering its own property.

Bore-holes were sunk and proved that the same beds that out-cropped on the surface extended under the sea with an appreciable increase in the thickness of the mineral. The "Scotia" areas were entered at a distance of about 4,000 feet from the shore, and conditions were found to be more favorable than had been hoped for. Since that time the slopes have been driven a considerable distance further, and mining is now being done on a larger scale.

The under-ground excavations extend several miles beneath the sea, where electric shovels, hurrying trams and the rush of large 20-ton skips present an ever busy and noisy scene. Commingled with the deafening sound of these are the sharp rattle of air drills, the hum of modern electric pumps and the whirr of the large fans that carry fresh air to the most remote parts of the mine.

The surface equipment at the Wabana Mines consists of a deckhead and accessory hoisting engines, ventilating fans air compressor, and power generating plant.

The cars, as they come loaded from the mine, pass on to the deckhead, where they are dumped one by one in an end-revolving tipple, the ore passing over a "grizzly" and into a gyratory crusher which delivers a 4-inch ring product on to an inclined 36-inch rubber picking belt. The ore is finally delivered into a storage bin and loaded from time to time into tramline cars which carry it to the shipping pier at the south side of the Island. Direct transportation as above is made to the shipping pier in summer.

EXTERIOR OF CHANGE HOUSE, SUBMARINE PLANT, WABANA, NFLD.

Stock Piling Ore

During the winter, from January to April, when navigation is closed, the ore is stock-piled by means of a system originated and patented by engineers of the Company. The method is unique

SYDNEY HARBOR, SHOWING LOCATION OF LIMESTONE QUARRIES.

inasmuch as no trestle work is required, although at times the pile reaches a height of 75 feet. The stock-piling is accomplished through the instrumentality of a side-dump car propelled by a

TRAMWAYS AND TIPPLES, WABANA, NFLD.

main and trail rope which is driven by a single drum engine. The steel rope is led from the engine which is placed a short distance to one side of the feeding chute, to a sheave wheel some three or four hundred feet distant, thence across a second sheave wheel to the line on which it is desired to pile the ore, and down this line to the car at the chute. From the other end of the car the rope passes around a sheave wheel back to the engine. This car is of the ordinary side dump type, possessing the necessary mechanism to open the doors when engaging a stop set in the track.

The car runs on a track at an inclination of about twenty degrees, which track is kept ahead of the pile a couple of car lengths by means of a wooden frame, the lower end of which is of sufficient weight to keep the loaded car from upsetting. The only labor necessary, excepting that of an engine driver, is when it is required from time to time to move the wooden frame ahead, and even then the heavy work is performed by the engine. By this means the ore is readily handled, as fast as it comes from the mines, up to 1,500 tons per day, and at the cost of under one cent per ton.

The ore stockpiled in the winter is picked up in the busiest part of the shipping season, and sent over the tramway to the shipping pier in the already mentioned fashion.

The rehandling of this ore can be done by steam shovel or, as is the current practice with the Scotia Company, by means of a scrape or drag bucket, controlled by a wire rope passing through a sheave pulley which runs back and forth upon a suspended steel cable, one end of which is fastened upon the top of a wooden tower. This tower contains a bin of from 30 to 40 tons capacity and the necessary chutes, etc., and is supported upon wheels, thus enabling the bucket to be operated along all the radii of the circle covered by the stockpile. The drag bucket is equipped with a tripable bottom door, opened by a curved tail striking against a plate situated in the tower frame, immediately above the bin. The bucket is operated by a double-drum duplex hoisting engine of the ordinary type, and the cycle of operations may be described as follows:

The bucket is lowered to the ground at the foot of the inclined pile of ore and its latch closed. A combined hoisting and forward motion is then imparted to the bucket, its nose being thus constantly kept against the pile until load-

LOADING PIER, SHOWING CONVEYORS AT WABANA, NFLD.

ed. The engine is next reversed and the loaded bucket rapidly conveyed upon the suspended wire back to the tower, when it is automatically dumped immediately over the bins in the manner already mentioned. This accomplished, the bucket is rapidly lowered and the cycle of operations repeated.

Surface Haulage System

To transport the ore from the mines to the shipping pier situated on the south side of the island, slightly more than two miles distant, a double-track tramway operated by an endless cable is employed. The tramway is in the form of the letter "T," the head of

STOCK PILE AND DECK HEAD, SUBMARINE MINE, WABANA, NFLD.

which lies parallel and close to the outcrop of the "Scotia" ore bed, tapping the various surface pits and the mines, No. 1 to the west and No. 2 to the east of the long leg which stretches in a straight line in a southerly direction across the Island to the shipping pier. The tramway is of 2 ft. gauge and has two tracks, one for loaded cars and the other for empties. Steel rails of 28 and 18 pounds per yard are used on the respective tram tracks.

At a point located midway between the mines, where the tramway separates in three directions, and locally called the "bottom," the grades are so arranged that, by ungripping the cars, they move by gravity each in the required direction; the loaded outgoing cars falling from the east and west "full" tracks into the pier or main full track, and the empties on either the east or west toward their respective empty track on either the east or west branch for distribution to the mines.

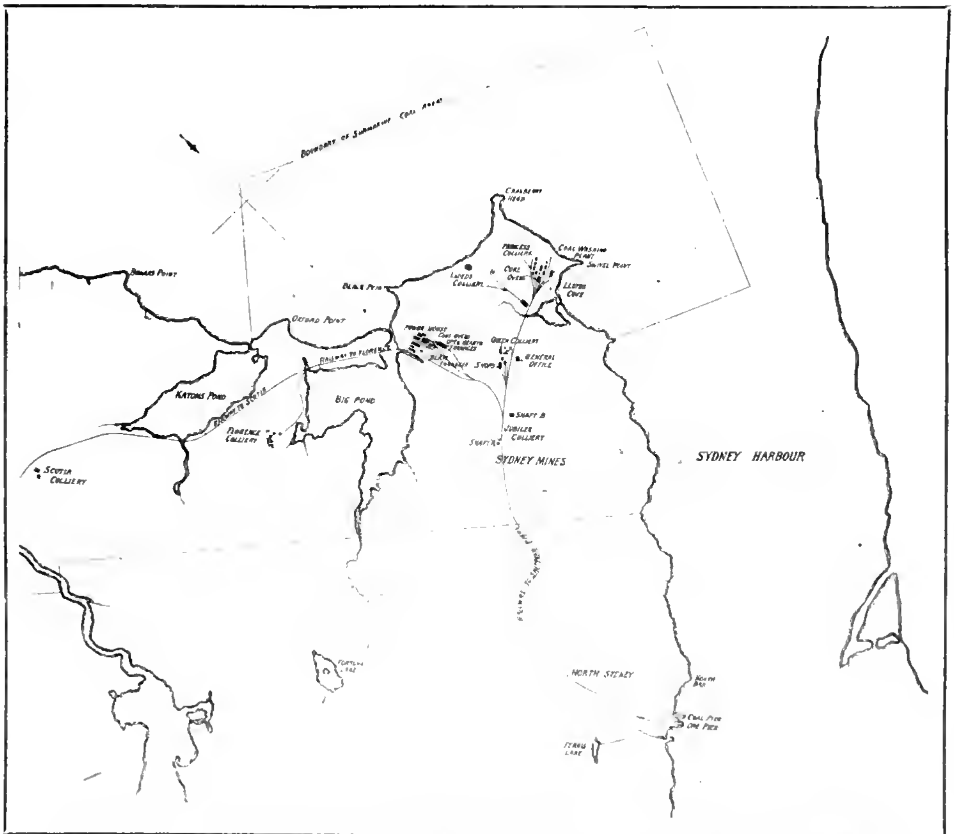
The cable of one-inch diameter "Lang Lay" plough steel, is supported upon wood rollers at short intervals, and by Hadfield cast manganese steel wheels at the crest of each rise. The cable is slightly over seven miles long, its tension being uniformly maintained by means of balance weights, placed near the haulage engine at the pier, and at the east and west extremities of the tramway. The tramway is operated by a compound condensing steam engine of 125 h.p., geared down to a driving bull-wheel to give a cable speed of 350 feet per minute. The power plant site is located alongside the shipping pier.

The cars, built of steel, have an average capacity of 1.8 tons of ore, as loaded from the chute. They are of 30 cubic ft. measurement, and are attached to the cable by means of grips, consisting of a series of levers readily operated by a plain wrench with a 30-inch handle.

ENGINE HOUSE AND DECK HEAD, SUBMARINE MINE, WABANA, NFLD.

Two of the grips, one at each end, hold the car securely to the cable upon the steepest grade on the line and may be used upon a grade up to 10 per cent.

Under existing conditions, the actual capacity of the line, allowing for all stops, is 3,000 tons per day; indeed, frequently by working overtime, the daily tonnage has been maintained at 4,000 tons per day for weeks at a time.



SHOWING LOCATION OF COLLIERIES, BLAST AND OPEN-HEARTH FURNACES. ETC., CAPE BRETON ISLAND.

Submarine Equipment

The development of the submarine areas has necessitated large additions to the equipment. A deck-head of an absolutely new type, in which the cars are handled without any horizontal landing, has been completed and is now in operation. The cars, each containing twenty tons of ore, are hauled up out of the mine by a rope one and one-eighth inches in diameter and eight thousand feet long. They dump their contents automatically, thus reducing to the minimum the number of men required to attend their operation.

The hoisting is done by a Fraser & Chalmers first motion, duplex, steam hoisting engine equipped with the most modern overwind and automatic braking devices. It is capable of considerable speed, rushing the big cars up the two-mile slope at the dizzy rate of thirty miles an hour. The cars are filled in the mine from bins, which in turn are supplied by small 2-ton mine cars.

Drilling, hoisting and pumping are all carried on through the instrumentality of compressed air. When mining was started on the land areas, two compressors were installed — a 1,200 cub. ft. capacity Norwalk machine and a 2,500 cub. ft. Norberg machine. Since then a Walker compressor of 3,500 cubic ft. capacity has been added. The pipe connections of all three machines are such that they may be operated as one plant or individually when it becomes necessary.

From April to December inclusive, two — ton cable cars transport the ore from the mine or stock-pile to the shipping piers some two miles distant. What appears like a never ending string of cars coming and going on the double track road bring their loads to tipples at a point some 250 feet above sea level.

the tipples in turn emptying the car contents into great natural gorges that have been modified to serve as receiving pockets. Two great endless chains of buckets convey the ore from the pockets to a point where it falls through chutes and automatic trimmers, a distance of 90 feet to the ship's hold underneath.

Recently there has been installed a modern electrical plant of considerable power, built on piles at the shipping pier and adjacent to the coal discharging plant. It consists of up-to-date water tube boilers and mechanical stokers, which supply steam to Belliss & Morcom vertical, forced lubrication type engines, operating Brown Boveri generators, producing 60 cycle, 3 phase current at 6,600 volts. At this voltage it is transmitted to the various points of distribution for transforming and service in both the land and submarine mine spheres of operation.

Piers

Wabana loading records, we understand, have never been equalled working under similar conditions, i.e., with a single loading chute. During the season of 1909, between April 19 and December 23, 460,000 tons were loaded in vessels at the Scotia pier in 308 loading hours. This calculation also includes the time spent in moving the vessels. therefore, the ore was loaded in ship's hold at the average rate of 1,500 tons per hour. On numerous occasions this rate has been very considerably increas-

NORTH SYDNEY SHIPPING PIER FROM ELEVATED TRACKS.

ed on single vessels, a rate of over 2,200 tons per hour having been attained on a 7,000-ton ship. These figures apply of course to loading through a single chute. Since 1913, when the east pier was put into service, the time of loading has been cut almost in half, and ships of the company carrying 12,500 tons each have been fully loaded in 3½ hours.

Power Dock

Immediately to the west of the pier from which the ore is shipped there is a large wharf for receiving incoming supplies, etc., and here is located a modern steam driven coal gantry for economically handling coal to operate the plant and to bunker ore steamers with despatch when coal is required by them. This apparatus can be operated by a single man and has a capacity of 1,000 tons per ten-hour day continuously.

Welfare Work

About 500 men are employed in and about the mines at Wabana, and for their accommodation there have been erected a large number of houses which are rented at a low monthly rate. The property of the "Scotia" company surrounding the plant is attractively laid out in streets and building lots, and West Wabana is rapidly becoming a town of considerable size and importance. A water system for fire and domestic supply purposes has been installed.

For the proper care and treatment of sick and injured, there has been built and equipped a small hospital. A well stocked dispensary and the necessary instruments and apparatus found in any well appointed institution of the kind are provided; also, the work in connection with it is in the care of a competent physician and nurse. Every man subscribes a small monthly fee for hospital purposes, this providing him with free medical treatment in case of sickness or injury. First aid boxes are placed at various points on the plant surface and underground for rendering prompt assistance to the injured.

PRINCESS COLLIERY, SHOWING SURFACE EQUIPMENT AT SYDNEY MINES.

The duty of providing safety arrangements and appliances about the workings is in the hands of a committee of the staff, who make weekly visits to different parts of the plant, and by study, recommendations, and regulations they seek to obtain the greatest immunity from accident and personal injury in all departments of the work from blasting to operation of machinery, tramming, etc. A large clean concrete change house has been built at a convenient point on the surface, where in a warm, well-lighted room, supplied with hot and cold water, the men may change their clothes, wash, or bath. Underground, large clean and well lighted lunch rooms are maintained, and hot

POURING 3-TON INGOTS, SYDNEY MINES.

and cold drinking water are supplied for the use of the workmen there.

Summary

The Wabana mine is to all appearances one of the largest deposits of iron ore of proven value at present operated anywhere. It consists of several beds occurring in a rock basin of large area, the greatest part of which extends under Conception Bay, Nfld., but outcrops upon the north shore of Bell Island. The deposit has now been worked continuously for twenty years, the production of ore increasing gradually from year to year until 1913, when the output amounted to over one-and-a-half million tons.

Notwithstanding that all the necessary facilities for efficient mining operations have been developed and utilized, further extensive additions and equipment of the most modern type are being installed to provide not only for the comfortable maintenance of the present output but for its early substantial increase in every direction.

From the land areas, over 12½ million tons have been mined to date. The submarine areas have been developed by means of slopes driven 7,300 feet out under the waters of Conception Bay, and the ore has been found to be fully maintained both in quality and quantity in this territory. No conditions have so far been met to affect adversely efficient and economical mining operations.

Sufficient ore has been developed in the submarine areas alone, over three-quarters of a million tons of ore having already been extracted, to assure an annual output of one million tons from this section uninterruptedly and for very many years to come.

The situation of the deposit on a comparatively small island in the Atlantic Ocean is ideal and unique, affording as it does the choice of catering to either or both European and American Continental markets. One half million tons of ore per year are sold in the United States and Europe, the remainder of the output being shipped to the company's furnaces at Sydney Mines, N.S.

A glance at the map of the world which appears on another page of this issue will indicate clearly the strategic location of the Wabana iron mines relative to all important home and foreign markets. The mines are almost directly on the route of North Atlantic shipping. The "Scotia" Company sells some half million tons of ore each year to Canada.

OPEN-HEARTH FURNACES AND CHARGING MACHINE, SYDNEY MINES.

SLAGGING BLAST FURNACE AT SYDNEY MINES

the United States and Europe, the balance of that mined being, as we have already seen shipped to its blast furnaces at Sydney Mines, N.S., for conversion into steel, and as such to its steel plant in New Glasgow, by rail, for conversion into finished and semi-finished steel products which in due course find their way to practically every corner of the civilized world.

Limestone Quarries

Limestone being an important accessory in blast furnace operation, it was absolutely essential that an adequate supply be both convenient to the steel-making installation and readily available. Nature again had made bountiful provision for successfully prosecuting the manufacture of steel in this respect.

At Point Edward, some nine miles distant from Sydney Mines, and connected with the main line of the Intercolonial Railway by a branch line 2½ miles long, limestone in quantity was discovered, and following the usual survey and investigation, a property of about 250 acres in extent containing carboniferous stone in layers, high grade and uniform in quality was acquired. The product here is got by quarrying, a Lidgerwood overhead cableway with two towers and radius of 800 feet being installed in connection with the latter. The limestone is mined on the open cut system, there being little top soil to remove, and as it is brought direct to the blast furnace from the quarry in railway cars, an abundant supply at a very low cost is readily at hand for smelting purposes at the Sydney Mines plant, or elsewhere.

QUEEN PIT AND ENGINE ROUND HOUSE, SYDNEY MINES.

Coal Areas

The estimated content of the Cape Breton coal properties of the Nova Scotia Steel & Coal Co. run to over 2,500,000 tons, and in addition to ranking high as company assets are among the most important holdings of their kind in Canada. For steam, metallurgical and general purposes, the coal recovered at Sydney Mines is highly regarded, being both comparatively pure and of high calorific value.

Four different coal areas are owned, these being known as the Sydney Mines Land, Sydney Mines Submarine, Boulardarie Land, and the Outer Submarine. The first three run continuously from the north side of Sydney harbor to the south side of the Great Bras d'Or, a distance of some ten miles or thereby.

The Outer Submarine areas extend from Cape Dauphin to Cape Percy, covering the entire Cape Breton coalfield, and, within their contained 21 square miles there is believed to exist every known seam in this already well - proven Sydney Mines district.

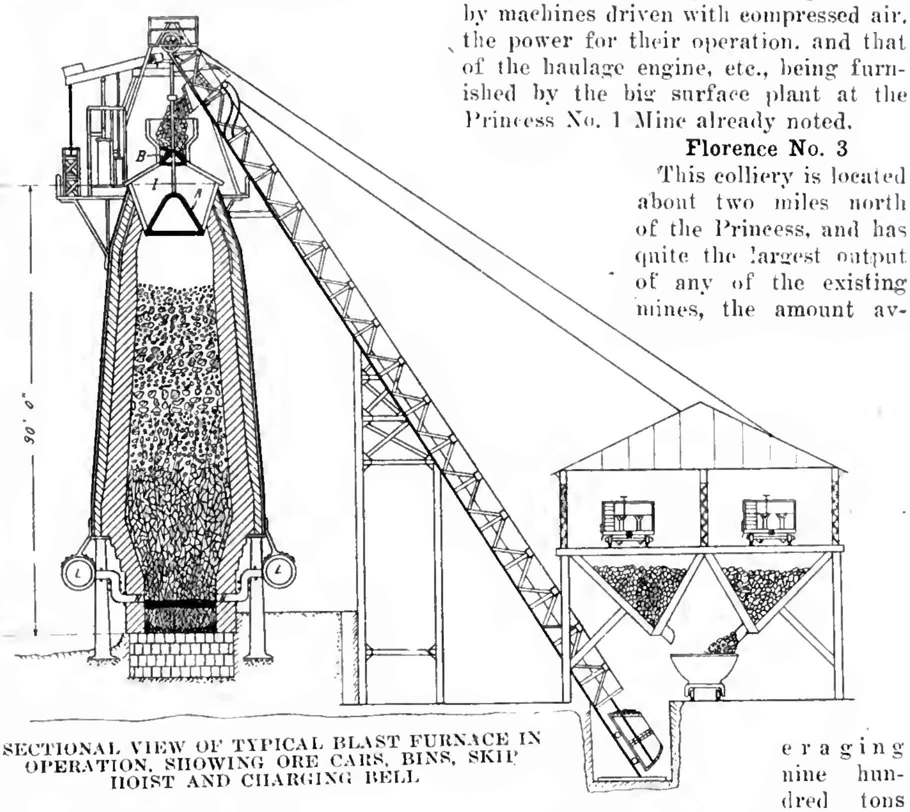
A comparatively small portion of these areas has been worked in the ninety years that mining has been carried on, operations having been confined almost entirely to the southern part of the Sydney Mines Land and Submarine Areas. Collieries have been opened in the central portion of that district only within the last four or five years, while as yet not a pound of coal had been taken from the Northern, the Boulardarie or the Outer Submarine fields.

The thickness of the coal in the various mines runs from five to six and a half feet, the dip being uniformly about eight per cent. The coal is largely mined by the bore and pillar method, but different systems of mining, pumping, haulage and ventilation are practised at the different mines to meet special or local conditions.

Since the Nova Scotia Steel & Coal Co. took over these properties much development has taken place at Sydney Mines. Where, in 1900, one colliery was in operation, with an annual output of

GENERAL VIEW FROM OFFICE OF STEEL PLANT AT SYDNEY MINES.

240,000 tons, to-day five well equipped mines are producing about 900,000 tons, and during the present year a new colliery will be adding 360,000 tons to the already substantial yearly output.



SECTIONAL VIEW OF TYPICAL BLAST FURNACE IN OPERATION, SHOWING ORE CARS, BINS, SKIP HOIST AND CHARGING BELL

At Sydney Mines there is also a modern steel plant, described later, with blast furnace and open-hearth steel capacity of about 100,000 tons per year, equipped with all the necessary coke ovens, coal washers and engineering shops. The railway system has been practically rebuilt and greatly extended, while at the shipping port of North Sydney, only three miles from the collieries and steel works, extensive docks, with the most modern facilities for coal shipping and ore receiving, have been constructed. This development has given new life to the sister towns of Sydney Mines and North Sydney, so much so that they have become two of the most important industrial centres in the Maritime Provinces. A brief description of the colleries now in operation follows:

Princess No. 1

This colliery was the only one in existence when "Scotia" took over the property from the General Mining Association in 1900. The coal cutting is done by hand. About six hundred men are employed underground, and the mine is equipped to maintain an average daily output of eight hundred tons. The surface plant is the most extensive of any of the collieries, being used as a central plant for many of the operations of Mines No. 2 and 5. Half the boilers at this plant burn waste gases from the nearby coke ovens and the remainder are fired with refuse stock from the coal washing plant, which is referred to later.

Lloyds No. 2

The capacity of this colliery is six hundred tons per day. Cutting is done by machines driven with compressed air, the power for their operation, and that of the haulage engine, etc., being furnished by the big surface plant at the Princess No. 1 Mine already noted.

Florence No. 3

This colliery is located about two miles north of the Princess, and has quite the largest output of any of the existing mines, the amount averaging nine hundred tons daily. Five hundred and fifty men are employed. Six 240 h.p. Stirling boilers supply steam for the different engines, and are equipped with forced draught fans to facilitate the burning of the fuel, which consists principally of waste from the coal washer.

Scotia No. 4

This is considered one of the most interesting mines on the Continent, not because of its size, but because of its being operated underground wholly by electricity. The cutting and handling of coal and the pumping of water is all done electrically. It is claimed to be the only colliery in Canada in which mechanical appliances are utilized to the utmost, although it does not contain a single steam or air pipe. The daily output of nine hundred tons is secured with a minimum of capital outlay and with low overhead charges.

Queen No. 5

This mine was opened up and first operated by the General Mining Association. It was one of the best producers at that time and was more familiarly known as "Queen Pit." The haulage system is now operated by electricity and its equipment is modern in every way. Its capacity is five hundred tons per day the year round.

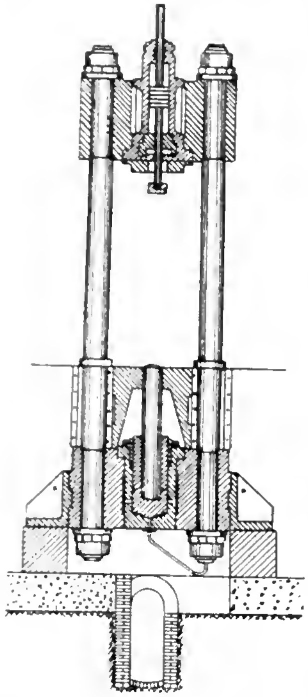
Jubilee No. 6

This is a new mine being opened up. It will have the largest capacity of the "Scotia" group, as its output will amount to about 1,500 tons per day. The shaft which was started in 1914 is now nearly finished, and other preparations are being made for commencement of operations during the present year.

In the three latest collieries to be operated the underground haulage, or method of conveying the coal from the working places to the main haulage of the mine, is performed by small engines, driven in one colliery by electricity and in the other two collieries by compress-

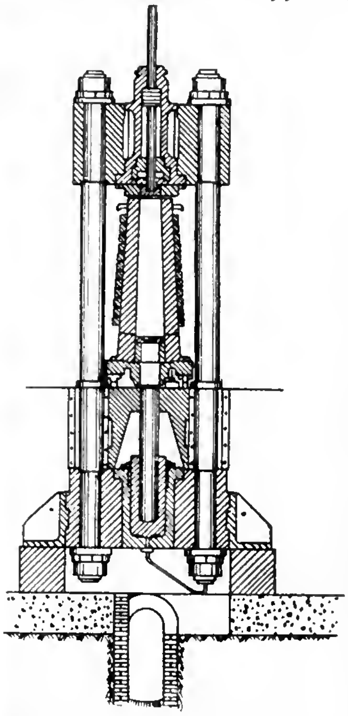
COKE OVENS SHOWING A "DRAW" IN FOREGROUND, SYDNEY MINES.

ed air. Not a single horse is employed underground in either of these three collieries (Nos. 2, 3 and 4), and no horses will be employed in the new Jubilee Colliery. This is an unusual condition of underground coal mining; either horses or ponies being used in nearly every coal mine. The adoption of electricity by "Scotia" on a large scale is the result of the thorough and satisfactory trial which has been given to this motive power. The Jubilee mine is to be operated altogether by it, both on the surface and underground.



HARMET PRESS. MOLD NOT IN POSITION.

POURING 6-TON INGOTS, SYDNEY MINES.



HARMET PRESS, MOLD IN POSITION.

All the coal mined from these collieries is screened as it is raised, and, of the output, 75 per cent. of merchantable coal is shipped by rail and water to the various markets, while the remaining 25 per cent. is washed and converted into coke for metallurgical pur-

POWER HOUSE, BLAST FURNACE, COKE OVENS, ETC., SYDNEY MINES

poses. The refuse from the washing plant is conveyed automatically to the colliery boilers.

Coal Washing Plant

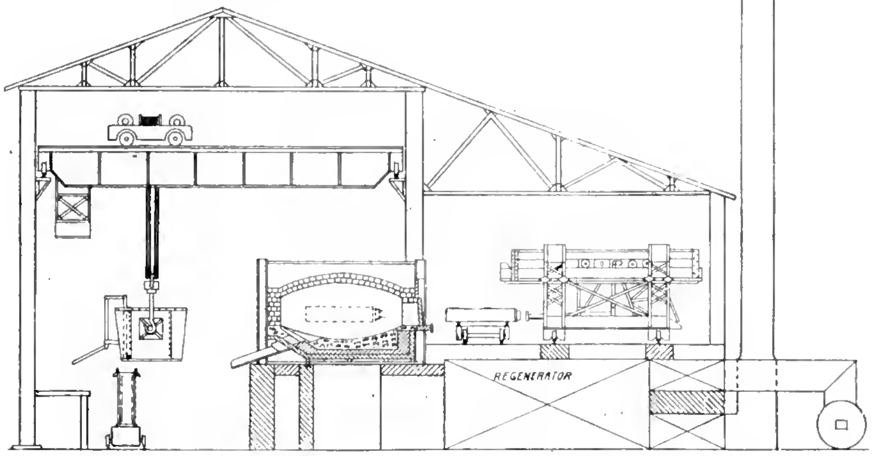
The construction of this plant was begun in June, 1913, and completed in the autumn of 1914. The washer is of the Baum type, the general arrangement of the plant being designed by Messrs. Simon-Carves, Manchester, England. It has a washing capacity of 1,000 tons of fine coal in ten hours. In general, it consists of a reinforced concrete building elevated about eighteen feet above the yard level and supported by reinforced concrete columns. Ahead of the building and under the tracks is a large pocket into which the raw slack coal is dumped from the railway car, after having first passed over a pair of two hundred ton track scales.

Alongside of the washery building is an elevated settling tank built of reinforced concrete and designed to hold 150,000 gallons of water, the water tank being protected on the outside by a suitable enclosure which provides sufficient air space to prevent freezing.

In the usual operation of this plant, the raw slack coal is dumped from either of two tracks into the elevator pit, and from there the coal is fed to a bucket elevator which delivers it to the large wash box on the upper floor of the building. Here all the coal is washed, no further treatment being necessary for the larger sizes, although the smaller sizes are rewashed and passed over a system of screens. The larger sizes are delivered by a series of bunker pockets to the crushers, while the smaller sizes are passed along to another washing box and rewashed. In the process of washing, the heavy slate and dirt eventually sink to the bottom of the box and are removed automatically by a spiral conveyor and elevator. This dirt is finally collected in a storage bin or is dropped through a cast iron pipe in which flows a stream of water that flushes the refuse material to the sea.

The purpose of the plant is to remove as far as possible all slate and sulphur from the coal. It is also essential to keep coal from being carried away with the refuse material. To reduce the waste to a minimum, a third or middle product is made by varying which the loss of coal becomes very slight and the quality of the washed product considerably improved.

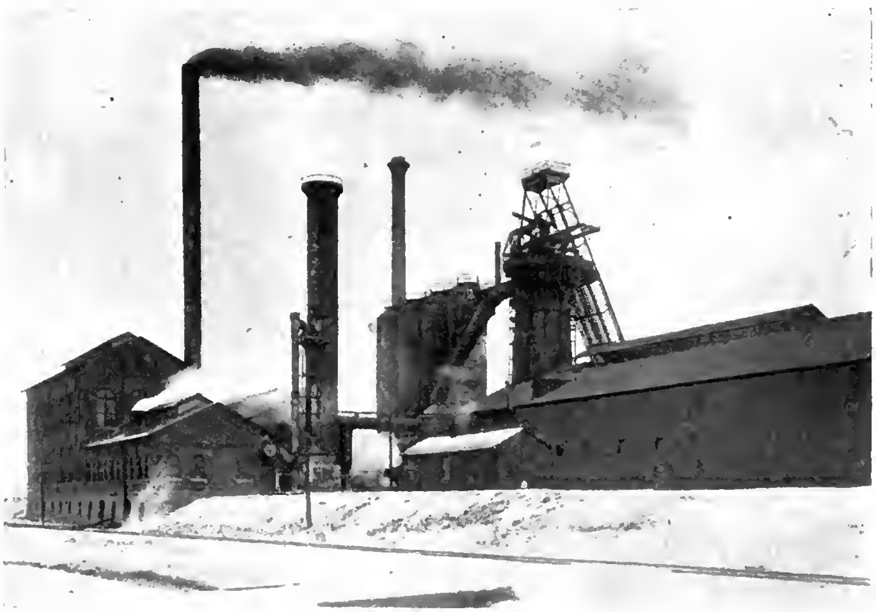
After the coal is washed, the larger sizes are divided into two grades of nut coal and may be shipped separately, or they may be again mixed and passed through a pair of rotary crushers and reduced to sizes sufficiently small for coking purposes. After passing through the crushers the coal is mixed with the fine slack and taken by a twenty-inch conveying belt to the storage tower near the coke ovens. The middle product coal, after being collected in a storage pocket, is transferred to a 16-inch belt conveyor, which carries it to the boiler-house, where it is weighed and distributed to pockets for use as fuel. The water used for washing the coal is collected in a drainage tank where it is clarified and used over again, the settlings being easily removed through a valve at the bottom.



SECTION OF TYPICAL OPEN- HEARTH FURNACE BUILDING.

Coke Ovens

The washed coal is at once conveyed into the neighboring coke ovens. These have been continuously improved and added to, so that at present they consist of 30 Bauer ovens at Princess Colliery, and 120 Bernard ovens, the total capacity of the united batteries being 300 tons of coke per day, all of which is used by the company for smelting purposes.



BLOWING ENGINE AND BOILER HOUSE, STOVES, BLAST FURNACE HOUSE AND EXTERIOR EQUIPMENT.

These latter ovens are situated convenient to the blast furnace, where the coke is consumed, so that after the coke is produced there is only one handling of it, and thus much breakage and waste is avoided; an important consideration.

Coal Handling Plants

At North Sydney are situated the coal loading and ore discharging piers. There are two coal piers, high and low level. The former is 60 feet above high water and is 1,000 feet long, including approaches. It is equipped with bins to hold 5,000 tons. Seven thousand tons have been handled over this pier in six hours.

The low level pier is thirty-four feet above high water, and has a length of 1,300 feet. This is used principally for loading small craft and for bunkering.

The company also possesses extensive docks at Quebec and Montreal. The Quebec plant consists of three gantry cranes situated on the Louise Basin, which discharge on the stock piles or into cars or lighters without further handling. The plant has a capacity of 3,000 tons per day.

the steel mill and forging plant at New Glasgow for final conversion into finished and semi-finished products to both home and foreign order

Fluid Compressed Steel Plant

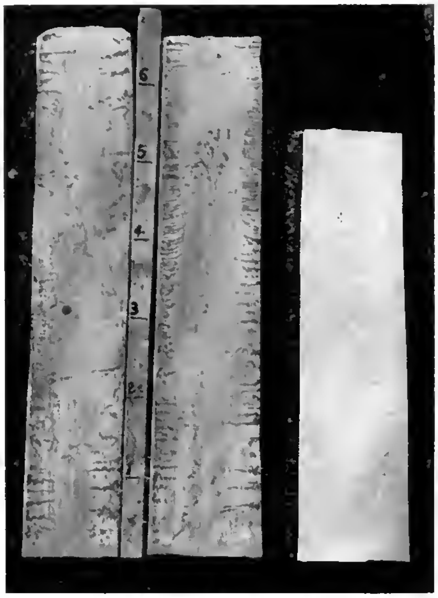
The chief additions made to the steel making plant at Sydney Mines since its initial service installation in 1905 may rightfully be stated as those connected with the installation of a complete equipment for the production of "fluid compressed" steel on the Harmet process. The open hearth furnace capacity with its contributary requirements has however also been increased.

By way of introduction, it may be stated that what is known as the Harmet process of making "fluid compressed" steel consists in submitting the ingot immediately after pouring, and while the metal is still plastic to intensive yet carefully calculated compression from all sides in a conical mold during the cooling period, the aim being to prevent the formation of pipe, blow holes, undue localized segregation or internal strains: in short to make the metal throughout the entire ingot homogeneous.

O. H. Ingot Defects

For many years much time has been given and research work undertaken relative to basic open-hearth steel, and many forms of treatment have been devised as a result, whereby its quality may be improved by eliminating defects inherent to and arising from its manufacture during different stages of the latter. Of the defects referred to, unsoundness of the cast ingot to a lesser or greater extent is easily the most serious. Varying degrees of success have been achieved by different methods of treatment, and not the least effective in the direction indicated has been that of the Harmet Fluid Compressed Steel Process.

The Nova Scotia Steel & Coal Co., realizing the importance of "fluid compression," as a valuable aid in manufacturing reliable and high class steel products, procured by purchase the Canadian license from M. Harmet, of St. Etienne, France, whereby they own the sole rights in this country to use his process. This they considered to be strictly in accordance with their policy of taking advantage of every important metallurgical development, thus advancing with modern progress; and particularly that their already well-known reputation as manufacturers of first quality marine, railway and general machinery forgings should be both maintained and enhanced.



A B C

SAWN INGOTS, A AND B, AS ORDINARILY CAST, AND C, MANUFACTURED BY HARMET PROCESS.

Note surface and other blow holes in A and B, also tendency to pipe in the latter, and absence of both in C.

INGOT STRIPPING YARD, SYDNEY MINES

The installation of the Harmet Fluid Compressed Steel Plant at Sydney Mines was made in 1912, however before entering into a detail description of the equipment, its operation and product, it may be well to point out a few facts concerning the ideals aimed at and being consummated by this and other somewhat similar processes. A generally held opinion and one too often carelessly expressed refers to steel as such being liable to unaccountable failures. For most purposes as against iron, even in spite of occasional and unaccountable failures, it has easily shown its superiority, and where it has fallen down there has simply been given additional impetus to research and improved methods of production.

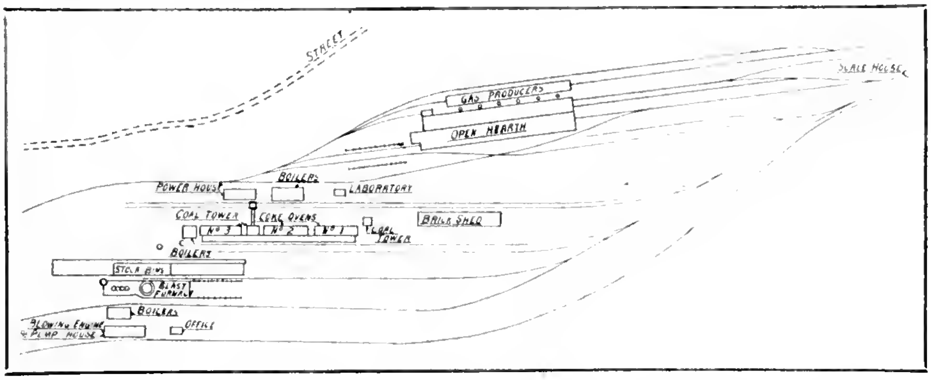
To not all steel manufacturers, however, does the latter statement apply, because for ordinary purposes, the usual merchant brands of steel are satisfactory and the cost of extra treatment would be prohibitive. Those who are placing on the market high grade steel for heavy forging purposes are however, applying the method known as the Fluid Compression Process, by which the metal is subjected to high pressure while passing from the molten to the solid state. The product of this process is used in the manufacture of first quality forgings, such as locomotive axles, crank shafts, marine forgings, artillery tubes and armor plate of the highest grade; in fact, for all articles in which maximum reliability and homogeneity of structure are demanded.

The defects most common in steel cast in ingot molds are:—Blowholes, pipes, porosities, cracks, internal stresses, segregation, and excessive crystallization. Blowholes are caused by the presence of occluded gases in the liquid metal. Iron, like water, has a higher solvent power for gases, such as carbon, monoxide, nitrogen and hydrogen, when liquid than when solid. Thus, during the solidification of the steel, the excess gas dissolved when the metal was liquid is expelled, and, becoming entangled in the hardening mass, causes bubbles or blowholes. These may either be deep-seated or located close to the surface. While both are highly undesirable, the latter are particularly so.

Ordinarily, deep-seated blowholes close up upon rolling or forging, and probably do little harm if sufficient work is done upon the metal, but in the case of large sections the necessary amount of work to effect this is seldom given. The blowholes which occur close to the surface are liable, while the ingot is being rolled or forged, to burst, thus caus-

ing a break, through which atmospheric oxygen and slag may enter the cavity. Should oxygen do so, it reacts with the iron of the interior wall of the blowhole, forming iron oxide, the presence of which effectually prevents welding and leaves a permanent flaw. To surface stresses are also set up in a similar fashion, due to the contraction of the metal, and these rend the metal with small fissures or cracks, which further increase the porosity of the central part of the ingot.

Segregation, or the unequal distribu-



LAYOUT OF BLAST FURNACE AND OPEN-HEARTH STEEL PLANT AT SYDNEY MINES.

blowholes are due, therefore, most of the surface cracks frequently found on turning up steel pieces.

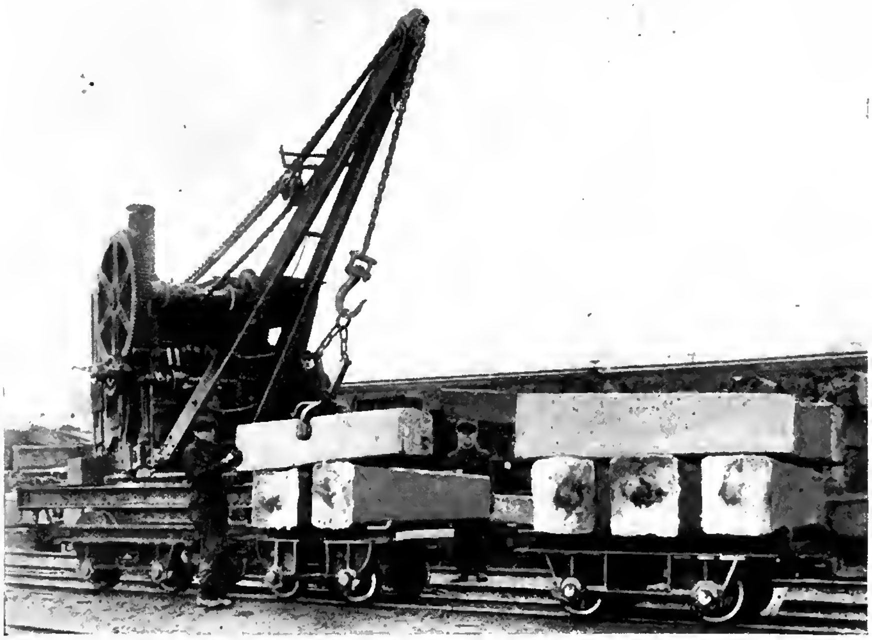
The "pipe" or central cavity is due to shrinkage, and is distinguished by an opening or void, usually found most highly developed near the top and toward the centre of the ingot. The same cause—shrinkage—produces a continuation of this defect downward along the longitudinal axis, the visible pipe gradually tapering away until its presence is only marked by the spongy or porous structure of the affected metal. If the ingot is allowed to cool undisturbed in the mold, this pipe, including the lower porous section, cannot well be avoided.

In cooling a freshly poured ingot, the outer crust of the steel first becomes rigid, and thus determines its outer dimensions. The greater part of the contraction has already taken place in the metal forming this shell, but there still remains the interior liquid, the volume of which is greatly modified by shrinkage during cooling. Little by little this molten metal becomes plastic, and, attaching itself progressively to the solid shell, adds to its thickness, and tends to leave a hollow portion or cavity equal in volume to that of the shrinkage of the metal. Simultaneously there is a tendency for the more fluid metal from the hotter portion of the ingot to flow in and fill up this area. The visible "pipe" is, therefore, caused by the gradual descent of the still liquid metal to fill up the void due to shrinkage.

Again, the shrinkage continues after solidification, and, as the metal of the outer shell of the ingot is colder and more solid than that toward the centre, therefore, the inevitable contraction accompanying cooling is made possible only by the growth of minute voids, thus causing a porous structure along the lower part of the central axis. Internal

tion of impurities throughout the ingot, is chiefly due to the melting points of these constituents being lower than that of iron. The cooling of the outer portions of the ingot causes a flow of these impurities to the more molten metal of the interior. The central and upper portions, being the last to solidify, thus show the greatest degree of segregation.

The effects of the presence of these different imperfections are important, and demand great care and attention in order to prevent serious defects in the finished product. If the ingot is allowed to cool freely, the formation of either the visible pipe or blowhole may be



LOADING 3½-TON INGOTS FOR COGGING MILL.

somewhat controlled, but both cannot be avoided, while the invisible effects accompanying the pipe, described as sponginess, segregation, and internal stresses, cannot well be prevented unless by some such process as is the subject of this description.

In producing steel for all ordinary purposes, the manufacturer cuts off the upper part of the ingot and discards it, thus avoiding the portions of the ingot most affected by the defects described. Where utmost reliability is essential, further efforts are made to minimize the injurious influence of defects by increasing the proportion of discard and by hollow-boring the ingot.

The discard, being of inferior quality, is utilized in the manufacture of low grade material, or is scrapped, a large percentage being fit only for the latter purpose. It will be noticed that by cropping and similar methods, no improvement in the quality of the material is attempted, but only a selection made of the most uniform portions of the ingot. It is apparent that this method of obtaining uniformity, besides being ineffective and uncertain, is also very expensive. Thus there is a strong incentive to crop as little of the top of the ingot as possible: hence much unsound steel. All the above irregularities in composition and in structure of steel are ultimately due to three forces, namely: crystallization, shrinkage and segregation, and the trouble developes during that period in which the liquid metal passes through the so-called solid solution stage into the stable solid state, or, in short, while it cools.

Whitworth System

Owing to the natural difficulties in the way, such as high temperature and weight of the mass to be handled, and the troublesome forces to be controlled, little was done to solve the problem of preventing the formation of defects accompanying solidification, until about

1865, when Sir Joseph Whitworth undertook the task. The solution which suggested itself to him was to submit solidifying steel to great pressure. This would force some, if not all, of the occluded gases to exude, reduce the blowholes to insignificant dimensions, and also would prevent the formation of pipes. Further, by equalizing the pressure throughout the mass, a more homogenous steel, both physically and chemically, would be obtained. The Whitworth process consisted, in brief, of subjecting the fluid steel, which had been poured into a side-strengthened cylindrical mold, to a pressure of above two tons per square inch, and preferably six tons or more, and continuing same throughout the cooling period of the metal. It was found when this pressure was applied that large volumes of gas were driven off, and the ingot shortened—rapidly at first, but later on more slowly: the entire shortening amounting to about eight to ten per cent. more than when cooled in the ordinary manner.

The objection to this process is its initial and operating cost, and its inefficiency, the latter due to the fact that the pressure is applied only at the top of the ingot. The effect is that the great force of the pressure is applied only in the walls of the ingot., which, in cooling rapidly, forms a crust with the rigidity of a column, thus arresting the force applied, and protecting the molten central portion from pressure. Thus, to accomplish compression, the maximum amount of energy appears necessary of application. There would also seem to be a tendency of the pressure in the Whitworth process to make ingots open up in a manner similar to the staves of a barrel, and to force the rich, segregated liquid from the interior into the cavities thus made. The improvement in the quality of steel subjected to this treatment is marked and very important nevertheless.

The Harmet process main objective is not so much to remedy the already-mentioned and other metal defects as to forestall their development. The process can be described briefly by saying that the ingot, immediately after pouring, and while still fluid, is lifted from below and pressed into a mold of diminished cross-sectional areas. The pressing is stopped only after the steel is chilled. The slightly conical form of the mold causes the pressure on the base to produce lateral compression, and with great effectiveness, due to the wedge-like action. The ingot is thus put under intense compression, transversely and longitudinally, with a relatively small expenditure of power.

The forces of this method of "Wire-Drawing," acting on the lateral surfaces or walls of the mass, as well as on the ends, cause these walls to be crushed inward to diminish the volume, and the work performed is found to be proportional to the total diminution in volume of the metal, or to the contraction for each pound of metal. This work has been found to be constant per unit of weight for steel of any definite chemical composition. It will be seen that the Harmet process possesses at least the advantages of the Whitworth press, while chief objections to fluid compression, as carried out by that method, are eliminated. The advantages claimed from the Harmet treatment, and substantiated in practice, are:

1.—Prevention of cracks due to shrinkage; prevention of internal stresses and resulting cracks or fissures.

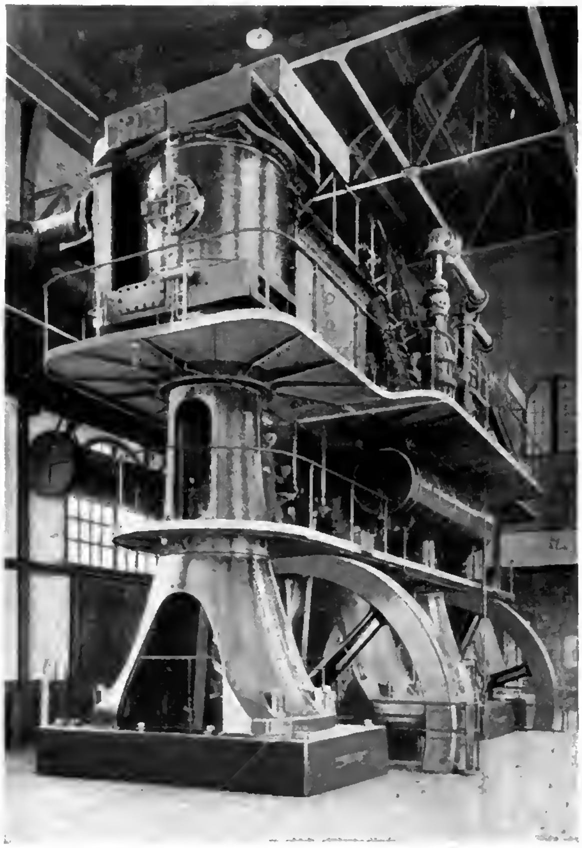
2.—Early cessation in the crystallization of the metal, as pressure hastens the transition from the liquid to the solid state; the production of fine crystallization without cleavage planes.

3.—Lessening of segregation, i.e.: reduction of tendency of carbon and other impurities to concentrate in the central and upper parts of the ingot. The gradual movement of the ingot upward into the cooler portion of the mold adds to this tendency.

4.—Prevention of "pipes" or interior cavities, due to the lateral pressure, and thus preservation of absolute solidity in the ingot.

5.—Improvement in physical properties, due to the mechanical effect of the operation being similar to forging.

6.—Reduction in the waste of ingot, practically no cropping being necessary, as the uniformity of composition and absence of cavities is maintained throughout the whole of the ingot.



"SOUTHWARK" BLAST FURNACE BLOWING ENGINES, SYDNEY MINES.

Fluid Steel Compression Plant Detail

The fluid compression plant installed at Sydney Mines consists of one group of Harmet presses each of 1,250 tons for handling four ingots of from 2½ to 5 tons weight at one time, and a 4,000 ton Harmet press for handling ingots of 12, 20 and 30 tons. The presses with their equipment of pumps, accumulators, operating valves, etc., are erected in an extension to the open-hearth buildings, situated close to the furnaces there, and arranged so that the pouring ladle containing the metal to be compressed has, as it comes directly from the furnaces, only a short distance to go to the pouring platform. The press proper consists of two hydraulic cylinders with actuating pistons, having at their ends rams which fit loosely the inside of the top and bottom of the ingot-mold respectively. The cylinders are held a certain fixed distance apart to allow the ingot mold to be introduced between them, when the rams are withdrawn. This is effected by heavy tie-rods, which are fastened to lugs upon the cylinders.

The ingot-molds are of cast iron, tapered, and strongly reinforced with steel bands to resist great pressure. They stand upon heavy movable cast-steel buggies, through the floor of which a short shaft transmits the pressure as received from the lower ram piston, imparting it to the bottom of the ingot. The upper ram is brought directly in contact with the metal at the top of the ingot, and merely acts as a buffer to the bottom ram which supplies the power for the actual compressing. The upper ram is slightly withdrawn from time to time as the ingot is pushed further into the mold. The mold buggies are movable and run on a horizontal track which extends sufficiently far on either side of the presses proper to give plenty of standage room.

In the case of the group press there is standage room for a train of four moulds quite clear of the presses. The buggies are hauled along the track by means of a hydraulic-operated conveyor until the correct position under the press is reached. Here it is securely held by

means of similarly actuated stops which come up through the floor. The pouring platform, upon which the ladle and stopper men stand when pouring the heat, is situated at the side of this track, slightly removed from the presses.

The empty mold is placed on its movable buggy, and when the metal is ready to be poured, is moved to a position immediately next the pouring platform. As soon as the mold is filled with metal it is propelled into position under the press. Each of the group molds is poured successively and the process proper commenced on each as soon as it is in position under the press.

Once this position is attained, a water spray is turned on to cool the top of the ingot in order that the metal may not adhere to the ram. The top ram is then let fall to come in contact with the metal. The bottom ram is next brought into service, a pressure gradually increasing up to over three tons per square inch of ingot bottom area being employed. The total pressure upon the ingot, in the case of 3-ton size amounts to 1,250 tons. The length of time before a full pressure is reached depends upon the size of the ingot, and may be taken as fifteen minutes for each ton of metal, or, say, forty-five minutes for a three-ton ingot. This maximum pressure is maintained for another fifteen minutes per ton of metal, thus bringing the total time under press for these conditions to one hour and a half.

Connected with each of the press rams is a system of cords leading to and operating a pencil moving over the surface of a constantly rotated cylindrical drum. The vertical movements of the pencil are proportional to those of the ram and show the longitudinal shrinkage of the ingot. Thus a continuous time-displacement curve is obtained for the compression period. The pressure upon the cylinders may be read directly from pressure gauges situated with the hydraulic controlling valves in front of the above-mentioned drums, upon the press operator's platform.

It has been found that in order to obtain the best quality of steel from ingots of certain size, form and composition, a definite curve must be followed, and once such a curve is obtained it is only necessary to cause the pencil or pointer to follow it in order to reproduce the same condition.

When the compression is finished, the bottom ram is withdrawn, and the top ram brought into play, thus stripping the ingot. The mold is then removed in the ordinary way and the ingot taken to the ingot yard. Ingots of 5 tons and upwards treated by the above plant are used solely for making heavy forgings at the company's steam-hydraulic forging plant at New Glasgow. From tests conducted on uncompressed and fluid compressed steel at the Sydney Mines plant, the results were such as to amply justify the claims already made for the Harmet process of manufacture as being superior in every feature where forging ingots of homogeneous structure and maximum reliability are called for.

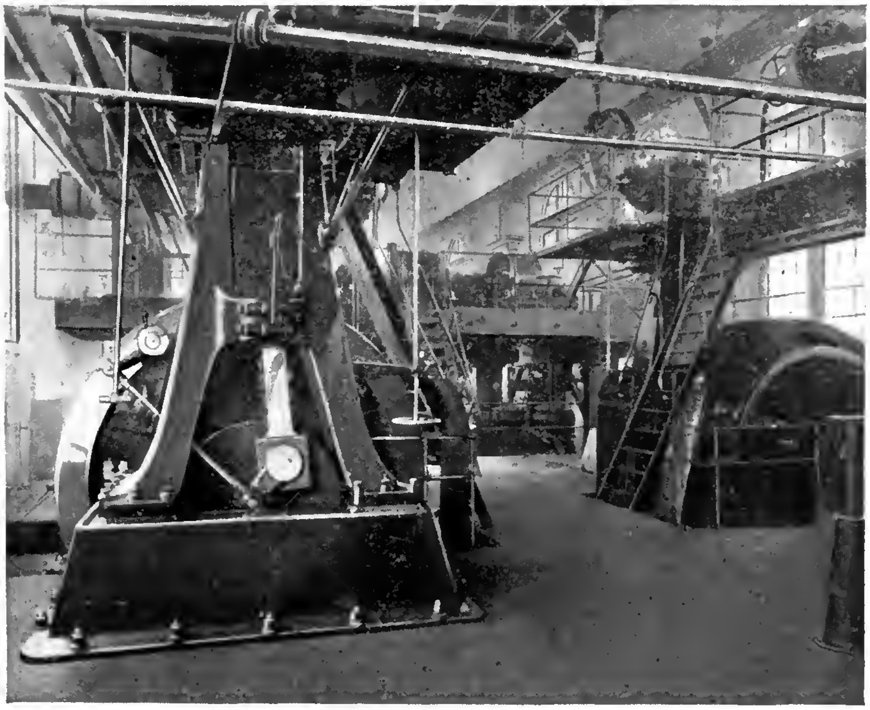
MAJOR C. L. CANTLEY,
Asst. Gen. Manager and Ordnance Adviser.

Miscellaneous Equipment Data

Coal Washer—The washed coal from the Washer plant is delivered on a Robins conveyor belt to the coke ovens storage tank, and the "middles" or boiler coal is delivered on a similar belt to the colliery boilers. The outstanding features of this plant are as follows:—The washed product before leaving the Washer is dried by natural drainage in the draining band down to eight per cent. moisture. There is also an ingenious device for the recovery of the fine floatings which are ordinarily lost. The last operation is the pulverizing of the coal, insuring thorough mixture; and the fact that all metallic substances are removed in the first washing box avoids the possibility of damage to the mechanism, which is incidental to the washing machinery in plants where the crushing is the first operation.

Coke Ovens—One battery of coke ovens in the vicinity of the Coal Washer Plant, of the Bauer retort type, is 38 ft. long, 7 ft. high, and 20-22 inches wide. The waste gases from these ovens are used to generate steam at Princess Colliery. The ovens are charged from the top, and the coke pushed by a steam-driven ram-type pusher. There are also three batteries of 40 ovens each—120 altogether—of Bernard retort type, their dimensions being 32 ft. long, 5 ft. 8 in. high, and 21-23 inches wide. The waste gases are used to generate steam for the electric power plant. Ovens are charged from the top, and coke is pushed by electrically-operated pushers.

Central Power Plant—The power plant is operated by three Stirling water-tube boilers, of 310 h.p. each, working at 200 lbs. pressure, with 100 degrees of superheat, together with nine fire-tube boilers, by Mathieson, New Glasgow, fired with waste heat from the ovens, working at 150 lbs. pressure, and developing approximately 100 h.p. each. The engine-room equipment consists of two 400 k.w. Canadian General Electric 250-volt, direct current generators, connected to two 18-in. and 36-in. diameter cylinders by 24-in. stroke vertical cross compound con-



POWER PLANT INTERIOR, SHOWING STEAM ENGINE AND STEAM TURBINE DRIVEN ELECTRIC GENERATORS, SYDNEY MINES.

densing Robb engines, running at 150 r.p.m. At present these engines are running non-condensing; the exhaust going to a mixed pressure 750 k.w. turbine of the Rateau multicellular type. There is also a 200 k.w. Canadian Westinghouse 220-volt, 3-phase, 60-cycle, motor-driven alternator. The 750 k.w. mixed pressure turbine is driven from three above-mentioned Stirling water-tube boilers, fired with the waste gases from coke ovens. A 2,000 k.w. steam tubine, to be connected to a 2,000 k.w., 3-phase, 60-cycle, 2,200-volt alternator, with surface condensing equipment, is now in course of construction.

Blast Furnace—The power equipment for the blast furnace consists of a compound disconnected blowing engine, with 72-inch blowing tubes, made by the Southward Foundry & Machine Co., Philadelphia, Pa. The engine is running condensing, with Worthington barometric condenser. The pumping equipment consists of three outside packed Epping-Carpenter circulating pumps, with a capacity of 36,000,000 gallons in twenty-four hours; and one Belliss & Morcom engine, direct connected to a Rees-Roturbo pump, which has a capacity of 4,000 gallons per minute. The power equipment is operated from six 300 h.p. Stirling water-tube boilers.

Open-Hearth—The open-hearth furnaces are fired by groups of four standard hand-fired Duff producers, except in one instance, where two mechanically-fired Chapman producers are used. The Basic Siemens-Martin process is used. The plant is equipped with two 75-ton ladle cranes, built by the Shaw Electric Crane Co., of Muskegon, Ohio. The ingots are stripped and handled with a combination electric yard and stripper crane, built by the Alliance Crane Co., of Alliance, Ohio. The furnaces are charged with a standard Wellman-Seaver electrically-driven charging machine, are of the latest open-hearth design, and are equipped with Blair water-cooled port ends and hoods. The plant has an approximate capacity of 14,000 tons per month.

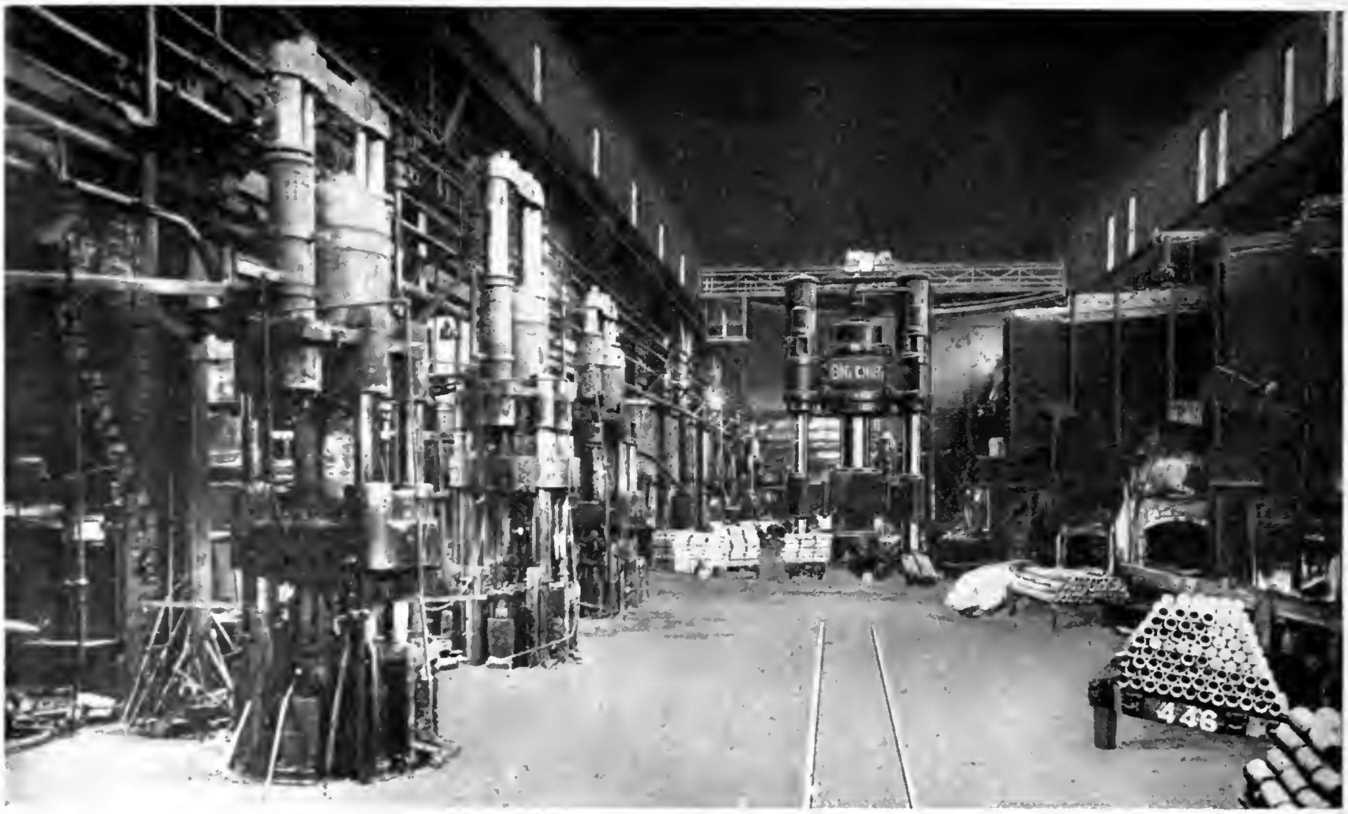
Welfare Work—Sydney Mines

At the various Sydney Mines plants, about 3,600 workmen are employed. The town of Sydney Mines is literally the creation of the "Scotia" Company, and is a model in every respect, comparing more than favorably with similar places either here or abroad.

When the property was acquired from the General Mining Association, the policy was adopted of dividing up the larger holdings into building lots in size of about 70 feet frontage and of 130 to 140 feet in depth. These lots were offered for sale to the general public at reasonable rates and to the workmen at a considerably lower figure. To further aid the workmen in their desire to become owners of comfortable homes, the Company agreed to build houses on the purchased lots on the instalment plan, each workman deciding on the plan of house most suitable for his requirements and repaying the advance at so much per month, with interest on the money. The whole amount being paid, the workman received a clear title to his house and land. The result has been the building of a clean modern town with attractive, comfortable, and substantial homes.

A large brick hospital costing in the vicinity of $65,000 has been erected, and is maintained by monthly subscriptions from every workman, by annual contribution from the company, the Town of Sydney Mines, County of Cape Breton, and Province of Nova Scotia. An efficient staff of physicians and nurses is always in attendance.

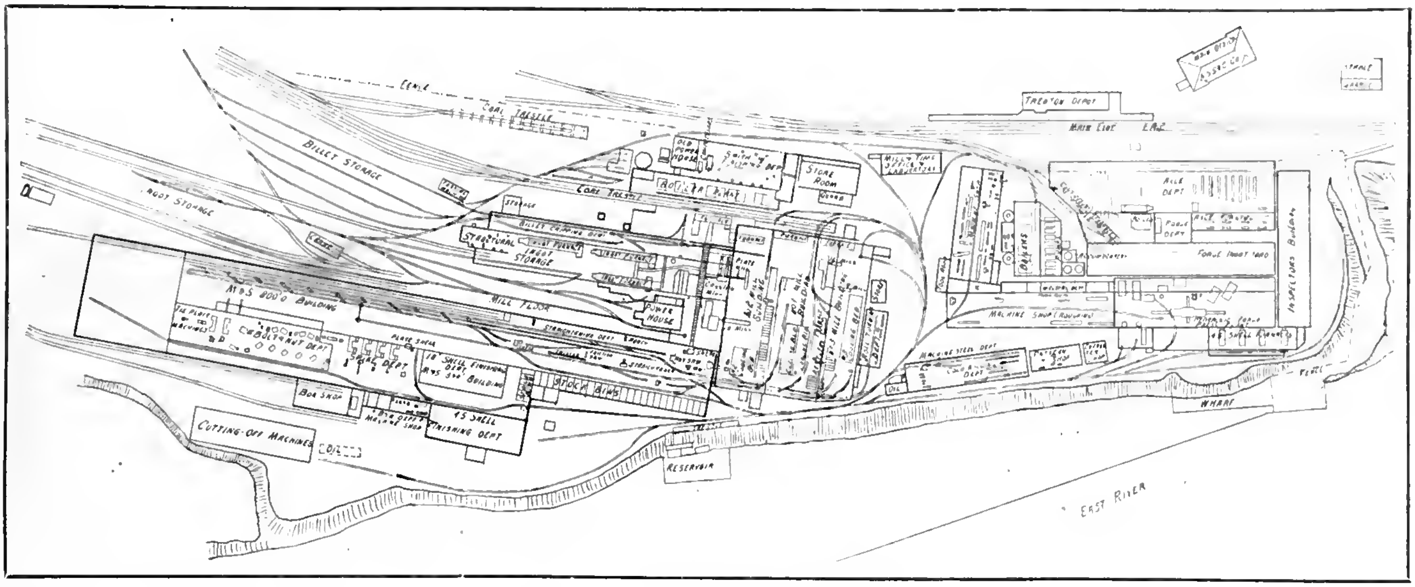
Well constructed ambulances constitute part of the equipment provided by the Scotia Company for the conveyance of the sick and injured. A "rescue car", furnished with all modern apparatus for fire fighting and rescue work in mines, and provided with all the necessities of a travelling hospital, stands on the railroad tracks in front of the general offices ready to be rushed to the point where needed. It is also worthy of mention that every officer of the Nova Scotia Steel & Coal Co., employed at the works, holds a certificate from the St. John's Ambulance Association, and is capable of rendering first aid to the injured.



FORGE PRESS SHOP, NEW GLASGOW, SHOWING "BIG CHIEF" IN CENTRE, WITH BATTERY OF SHELL FORGING PRESSES AND HEATING FURNACES AT LEFT AND RIGHT FOREGROUND, RESPECTIVELY.

First aid boxes are placed at the collieries and at the different surface plants, and two officers are employed, one on the surface and one underground, whose sole duties are to investigate conditions about the plant or mines, and take steps to insure protection for the men at their work. Further, by means of literature and notices, the "safety first" movement is encouraged and promoted among the employees with beneficial results. Change houses are also provided at all collieries where the workmen may wash and change their clothes on completion of their shift.

One other feature showing the friendly relations existing between Company and workmen is the provision made by the Company for the free transportation of the men every morning and evening from their homes to the different works. The trains are comfortable, well lighted and heated, are a great convenience to the employees, and their institution has been decidedly advantageous to the Company and the town of Sydney Mines generally. As a result, the building of houses is concentrated in the town and there are no struggling untidy villages surrounding the various collieries.



PLANT LAYOUT, NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.

New Glasgow Plant

At New Glasgow, or properly speaking, at Trenton, two miles from New Glasgow, are located the rolling mills, forges, machine shops, etc. of the Nova Scotia Steel & Coal Co. This plant is housed in a group of modern steel and concrete structures extending over 25 acres, and the various departments are equipped with the latest and, therefore, most up-to-date machinery for their special manufacturing purpose.

Rolling Mill Department

The rolling mill section consists of the following:—A 28-inch cogging mill of Lamberton design, complete with live rolls, and driven by a 33 in. x 38 in., double reversing, non-condensing, simple steam engine. On this mill, steel ingots, weighing $3\frac{1}{2}$ tons are reduced to billets of the different sizes required by the finishing mills.

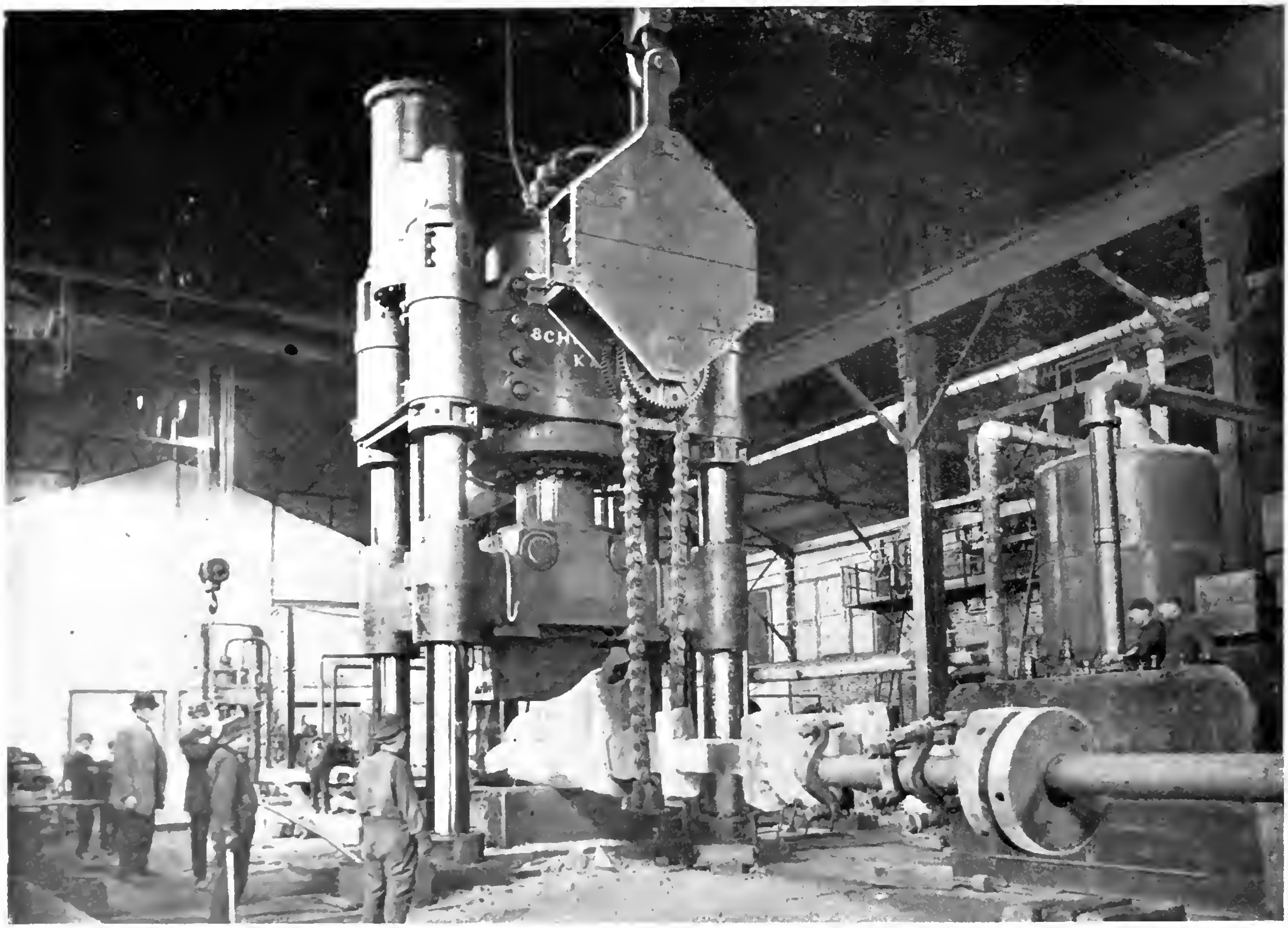
An 18 in. "Merchant" bar mill, with two set finishing housing, 3 high; one 9-in. guide mill, 3 high; one 9-in. guide mill with 14-in. roughing train, each of Belgian type, and complete with accessories, driving engines, cooling beds, shears,

PROPERTIES AND PLANTS OF THE NOVA SCOTIA STEEL & COAL CO., AND OF THE EASTERN CAR COMPANY AT NEW GLASGOW, N.S.

controlling electric cranes, continuous heating furnaces, etc.

A 20-in., 3 high plate mill, with capacity for rolling plates from No. 12 gauge up to one inch thick by 48 in. wide, and driven by a 30 in. x 48 in. double compound engine.

The high pressure hydraulic water used for the manipulating apparatus of the larger mills is supplied by an electrically-controlled multicellular centrifugal pump, driven by a direct-connected low-pressure steam turbine. Steam from the mill engines is delivered to a central



4,000 TON STEAM HYDRAULIC PRESS FORGING A SHIP'S RUDDER HEAD.

power station, where it is collected in a regenerator and passed on to Adamson-Rateau low-pressure turbo-generator sets. Two units of these, of 500 k.w. each, produce the electric current operating the various cranes and electrical machines throughout the plant.

The steel rolled in the above mills comes, as already stated, from the company's furnaces at Sydney Mines in the form of ingots. The latter, after reheating in modern continuous heating furnaces of the contra-flow type, are cogged down in the slabbing mill to the various size billets required, and then sent to the smaller mills to be rolled in a variety of product. In the rolling mill section, all of the standard merchant bars, flats, rounds, squares, angles, tees, tram rails—40 lbs. per yard and under, as well as numbers shapes for agricultural purposes, are taken care of. In connection with the bar mill, there are cold twisting bar machines, capable of twisting bars up to 2½ inches square for use in reinforced construction of buildings, bridges and other structural work. The 18-in. bar mill produces rounds up to 5 inches in diameter, squares up to 4 inches square and flats up to 15 inches wide. The 9-in. bar mill produces smaller sizes of rounds, squares and flats of all sections and shapes as required.

Spikes, Rivets, Bolts, etc.

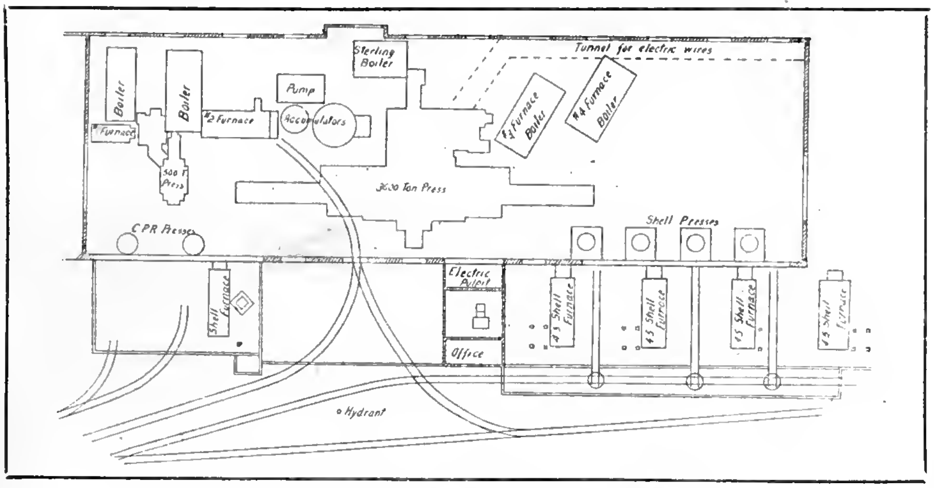
The railroad spike, rivet, bolt and nut, track tie and fish plate, reeled machinery steel and other finishing departments are located in two steel and concrete buildings, which cover 2½ acres of floor space, and are equipped with all the latest machinery. Some idea of the magnitude of the operations carried on here can be gathered from the fact that over 700 varieties of bars, plates, angles, etc., are annually turned out from these mills and their attendant finishing departments. Standard bolts, nuts and rivets of the more common sizes for general engineering services are a feature of this department, as is also the equipment for producing polished or cold rolled steel shafting.

Fluid Compressed Steel Forging

In every branch of industry, steel is required. Our civilization calls for it as a necessity. The demand is for sound steel, and it is recognized by the industrial world that failure to secure this all-important product is the cause of many of its greatest losses. Without subjecting the metal to some process as that already described, inability to produce a thoroughly reliable steel to meet the most exacting requirements must be at once and fully admitted.

The mere existence of this desired material—sound steel is, however, not enough: it must be manufactured into marketable products by the aid of tools, conforming in their action to the nature of the metal, as well as producing same in an economical manner. That is, while fluid compression is of vital importance to steel, the treatment of this raw material in the production of high-class forgings demands special care on the part of the mechanic, and the utilization of the best machinery. Bearing this in

mind, the further treatment of fluid-compressed steel for the production of high-class forgings was closely studied by the "Scotia" management, with the result that a complete forge plant does duty now in place of that which first made and maintained the company's



LAYOUT OF FORGE PRESS SHOP, NEW GLASGOW.

reputation for so long a period. The forging plant installed at the New Glasgow Works contains two of the most modern steam-hydraulic presses in use to-day. A brief description of this plant, with a statement concerning its products follows. This can perhaps best be introduced by a short summary of the history of heavy forging presses.

Concerning Heavy Forging Presses

Nasmyth's invention of the steam hammer in 1833 revolutionized the forging process of his day. During the latter part of the nineteenth century enormous progress was made in engineering and ship building, therefore, forgings were required of a size unknown not many years previous. In turn, this resulted in a great increase in the size of forging appliances. Steam hammers were largely used at first, and served their purpose well, but as the size of forgings grew, the hammer, being unable to develop a blow with sufficient penetration, became more and more unsatisfactory, and hydraulic forging presses, operated by means of accumulators, were introduced. Among the first of these was one constructed at the Armstrong Works in 1850. However, they proved so slow in operation and so expensive, that large steam hammers could still successfully compete with them. In 1860, a hammer was installed at the Krupp Works, Essen, Germany, having a 50-ton ram, and 1,000-ton anvil, while as late as 1901, a 125-ton steam hammer was installed at the South Bethlehem Works of the Bethlehem Steel Co. Although the latter was easily the largest hammer ever constructed, it was early replaced by a more efficient press.

With a hammer of this size, the force of the blow was enormous, but there were numerous difficulties in its operation. The energy developed, depending upon the weight of the falling parts, and the height through which it acted, was delivered suddenly and was exerted for but a moment. Repeated blows were, therefore, necessary, taking longer time than the press, and with a consequent low efficiency in steam consumption. The constant vibration made it difficult to keep a large hammer in adjustment, and wear and tear was excessive. Lastly, the lack of control with which the blow is delivered made it difficult to produce good work, and particularly to finish up heavy forgings. Thus, the relatively small output and high operating cost make hammers economically as well as technically unsuccessful in dealing with heavy forgings of every kind.

CAR WHEEL AXLE FORGING HAMMER IN OPERATION.

The need for a more effective and cheaper method of manufacture was met by the "Steam-Hydraulic" Press, introduced in the late eighties, in which are united the advantages of the steam hammer, combined with those of the hydraulic press. In this apparatus, steam cylinders lift the striking piece or tup, which thus moves with the speed and force of a steam hammer; while constant hydraulic pressure may be supplied at any stage of the stroke by a large water cylinder. This hydraulic pressure water is intensified in, and flows from, a separate apparatus called an intensifier. Thus, the pressure and speed of blows and compression can be varied widely to meet different conditions. Also, the energy required for producing high hydraulic pressure is called for only when needed. In the most modern type, in which the "Scotia" presses are the last word, these features enable much larger as well as a greater range of work to be performed.

Steam-Hydraulic Press Product

The product of a modern steam-hydraulic press is denser and more homogenous than can be secured with the steam hammer, due to the effect of the blow of the latter not penetrating to the centre, in contradistinction to the uniform kneeding effect of the press; while the amount of work that can be done by the latter at one time with little variation in temperature tends strongly to create a better product. The required heat treatment is simplified by reducing the number of heatings and their duration. It also reduces the liability of damage due to working at a blue heat. The greater uniformity and reliability of steam hydraulic forgings make their use imperative wherever exacting forging requirements have to be met.

The New Glasgow plant consists of two presses, each complete with manipulating devices, heating furnaces, etc.,

housed in a steel, brick and concrete building, 240 ft. by 72 ft. Two electric cranes of 50 and 30 tons capacity respectively, command the entire building. One press has a capacity of 600 tons, the other of 4,000 tons. The steam pressure is 140 lbs. per square inch. The larger press has a space of 128 ins. by 64 ins., between supporting columns, a short stroke of 7 in., a total stroke of 80 in., a weight of 740,000 lbs., and is adapted for forgings up to 75 tons. As the presses are exactly similar, except in size, the following description fits each:

ROD AND BAR MILL.

Forging Presses Description

Each installation consists of the press proper, the prefilling water tank, and the patent hydraulic intensifier. The press consists of a heavy base plate, embedded in the concrete foundations on which stands the anvil, also the four-forged steel columns which support the press head. Situated near the top of the press are two return steam cylinders, and the hydraulic or ram cylinder, which is located on the centre line. Immediately below the press head is situated the press traverse, the upper end of which is attached to the piston rods of the three cylinders above referred to. Below the traverse is fastened the upper forging tool or tup. The traverse has four bushed guides, encirling and sliding on the supporting columns to keep it in alignment and take up the heavy side strains when the ingot is not exactly under the tool centre.

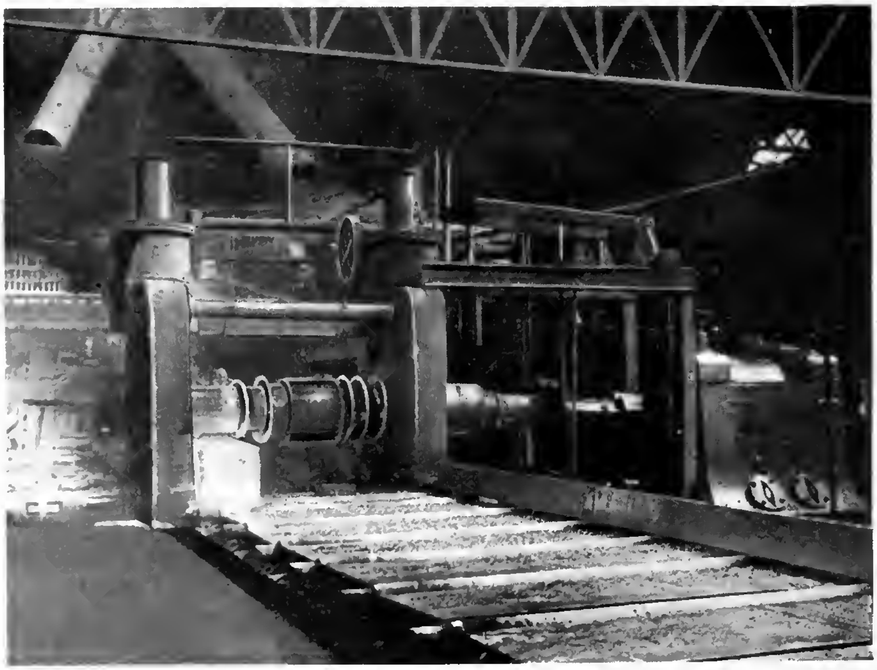
The prefilling water tank is an air chamber equipped with a pump for charging to a certain level at the pressure of 65 lbs. to the square inch. This tank supplies water to the ram and intensifier cylinders, and again stores the water which leaves the ram cylinder when the piston rises, the flow being automatically controlled by a water valve.

The intensifier, which produces the high hydraulic pressure, consists of two cylinders, a large one, with steam actuated piston, placed immediately above a smaller one containing water. They have a common piston rod, the lower end of which, extending through and working in the water cylinder, acts as the plunger of a force pump. When the steam cylinder piston moves upwards, the water is forced from an opening near the top of the lower or water cylinder, at very high pressure owing to the difference in their diameters, and enters the ram cylinder, giving a greatly increased pressure there. The intensification is fifty to one, and gives a water pressure of $3\frac{1}{2}$ tons per square inch in the ram cylinder.

This type of intensifier, we are informed, possesses many advantages over that of the ordinary type where the steam cylinder is below, in that the design of the whole is lower, giving freer access to the working parts. The piston rod is always in tension, resulting in less wear and tear on the glands, which, therefore, are more readily kept tight. Vibration in the press is largely eliminated by the valve arrangement which admits steam on the inside of the lower cover of the steam cylinder, thus providing a steam cushion, and resulting in a noiseless drop. The valve system is automatic in controlling the press, and prevents any injury to the tups or dies due to momentum, for instance when cutting, for the weight of the tup is at once taken up by the under steam in the press traverse steam lifting cylinders. All the valves controlling the various operations are located at the side of the intensifier, and all are operated by a single lever, so connected in a system that the press follows the control lever movements in speed and stroke.

Forging Presses Operation

The press may be operated in four different ways, and under each the tup may at any moment be arrested instantly, and a new stroke inaugurated by a single movement of the controlling lever. The tup may be actuated (1)—by the steam cylinder alone, the press then operating like an ordinary single-acting steam hammer; (2)—with intensifier giving high pressure only toward the end of the stroke (this is the method used in ordinary forge work); (3)—with high pressure throughout the entire stroke, used in pure press work, cutting, etc.; (4)—with intensifier and under steam cylinders, which results in rapidly repeated heavy blows delivered at a fixed height. This method is used for finishing work to exact size, the length of the stroke being automatically controlled. At all times, steam pressure is acting on the under side of the press steam pis-



28-INCH "LAMBERTON" INGOT COGGING MILL.

ton. This serves as a cushion or restraining force to any sudden movement of the tup, which would be caused by its shearing through the metal under it, thus resulting in an instantaneous diminution of opposition to the forward movement of the shearing tool. A maximum stroke of only seven inches is possible with high hydraulic pressure, owing to the small capacity of the intensifier hydraulic ram cylinder, but by means of a single stroke of the control lever, the ram cylinder may be refilled with water, and the press piston given another downward stroke of seven inches. This operation of taking a new hold as it were, may be repeated throughout the total stroke of the tup, enabling pressing and cutting to continue at a uniform pressure.

BATTERY OF SPIKE-MAKING MACHINES.

Mechanical Handling Equipment

When making heavy forgings, whether with hammers or presses, the piece must be frequently moved and turned, especially when the finishing strokes are being given. To do this speedily and cheaply, a mechanical handling equipment has been installed, the forging being suspended and rotated by an endless chain driven by electric gear attached to the forge crane. This crane may be operated from the usual cage suspended from the crane, and also from a pulpit at floor level, close to the presses. Hydraulic manipulator and mandrel gear are provided for forging long, massive shafts, cylinders and turbine casings, etc. There are also two hydraulic operated rests on each side of the big press for supporting long forgings. These have a travel of 20 feet each way. Hydraulic manipulating gears are provided for adjusting the different bottom anvils. On the large press, the stroke of this appliance is about 12 feet. Rapid working, range of utility, economy and every other requirement of modern forging practice, are well secured by this plant. The steam consumption is extraordinarily low, as the cylinders do not have to be kept filled continuously. The plant as a whole is exceedingly compact.

Cold Rolling Department

In the cold rolling department, the equipment consists of five machines for cutting shafting, but at present on shell stocks; three of these probably built at the plant, one of the others being made by Marshall, Husehart Mfg. Co., Chicago, Ill., and the other by the Brighton Mfg. Co., Shelby, Ohio.

One shear and straightener machine, by Long & Allstatter Co., Hamilton, Ohio.

One straightener machine for cold roll shafting.

One small reeler; one drawing machine for shafting, by Goldie & McCulloch Co., Galt, Ont.

One big reeler, by Goldie & McCulloch Co., Galt, Ont.

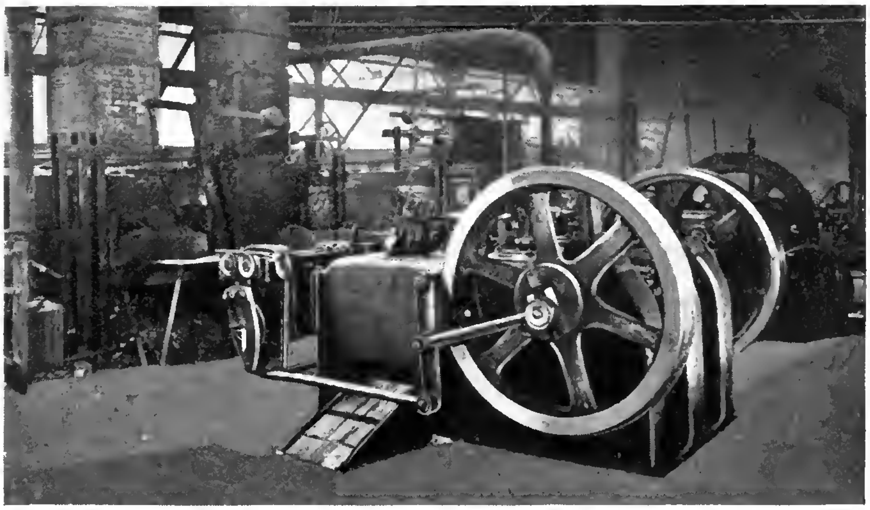
One small and one large turning machine made at the plant and by the Brightman Mfg. Co., Cleveland, Ohio, respectively.

The following machines in addition to the above are in continuous employment cutting shell stock:—

Two lathes on 4.5-in. stock, by John H. Hall & Sons, Brantford, Ont.

Five machines for cutting 60 pdr. shell stock, by Hurlbutt Rogers Machinery Co., South Sudbury, Mass.

Three machines for 60 pdr. shell stock, by Davis Machine Tool Co., Rochester, N.Y.



BATTERY OF BOLT AND NUT MACHINES.

Smith and Finishing Departments

For the work of this department, there are installed one 800 and one 500 pound steam hammer, both built by Bells Steam Engine Works, Buffalo, N.Y.; three sets plate shears, embracing one alligator plate shears, one finishing plate shears, one plate shears for miscellaneous work, also thirteen blacksmith forges.

Ingot Storage and Heating Furnaces

The ingot storage floor is supplied with narrow gauge railway for transporting ingots. A 15-ton traveling crane is installed for the transfer of ingots to A.E. and A. W. furnaces. After passing through the latter the ingots are carried to the 28-inch cogging mill for rolling into the various sizes required. Each ingot weight about 3½ tons and remains about 10 hrs. in the heating furnace. Traveling the entire length of furnace, they continally arrive at a higher temperature until the desired amount of 1,700 deg.-1,900 deg. is reached; the variation in the two temperatures quoted being dependent on the percentage of carbon present in the ingot.

The furnaces hold from 38 to 40 ingots each, and are 82 ft. by 10 ft. The ingots travel through the furnace on water-cooled skids 3 ft. apart, and 2 ft. off bottom of furnace, permitting fire to travel over and under ingots. One man through the medium of hydraulic pressure attends to all the operations of canting and delivering ingots to electric motor trucks for transfer to cogging mill. The furnaces were designed and constructed wholly by the "Scotia" Co., the manipulators for canting the ingots being covered by patents held by the company.

The ingots are pushed in at back end of furnace and out at front by a hydrau-

lic pusher, thence out to transfer car which is attached to an endless steel cable, being finally deposited at the live rolls driven by electric motor. After ingots are rolled down to required sizes—3¼ in. by 3¼ in., or 8 in. by 8 in., they are carried along the live rolls to the hot billet shears where they are cut into required length, cooled and delivered to the different mills for further rolling down to the various shapes ordered, such as angles, rods, shafting, etc.

In addition to the above ingot furnaces there are five others similarly constructed to heat smaller billets for mills Nos. 1, 2, and 3. No. 2 mill engine operates rolls for rails, fish-plates, angles, 15 and 18 pdr. shell stock, 4.5-in. shell stock, 90 pdr. shell stock, flats, rounds, etc. At the far end of these rolls are two fish-plate machines; these are also used for 18 and 15 pdr. shell stock, or heavy plate. Both are driven by electric motors. Other equipment consists of one steam drop hammer for straightening fish-plates; shears for angles, flats, etc.

Mill Buildings, 1 and 3

In No. 3 mill building, the equipment consists of a mill engine by Matheson & Co., New Glasgow, for No. 3 mill; also shears for cutting flats, spike material, scrap, etc.

No. 1 mill building, contains a mill engine which drives rolls for producing small flats, rounds, discs, small rails, etc.; other equipment consists of two steam shears for cutting up scrap; one oil heated annealing furnace for hardening shell stock, rounds, etc.; two reelers for reeling machinery steel rounds, etc.

Billet shipping depot—This consists of a long storage floor supplied by two narrow gauge tracks with storage capacity between for material in transit.

Manufacturing and Shipping Departments

The manufacturing and shipping departments consist of two buildings—one 800 ft. by 75 ft., and the other of 540 ft. by 75 ft., with a new extension of 150 ft. by 140 ft. The first is equipped with a standard narrow gauge railway and the following variety of machines:—

One store room shears for cutting small stock for shipment and made by the U.S. Engine Foundry Co., Youngston, Ohio.

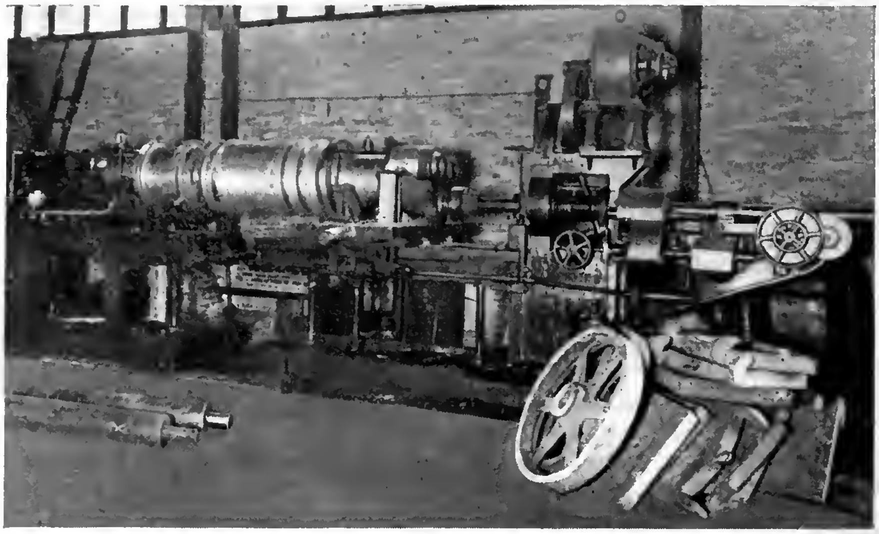
One straightening machine for angles, shell stock, rails, etc., made by Kane & Roache, Syracuse, N.Y.

Two small straighteners for small flats, wagon tires, small angles, etc., made by Kane & Roache, Syracuse, N.Y.

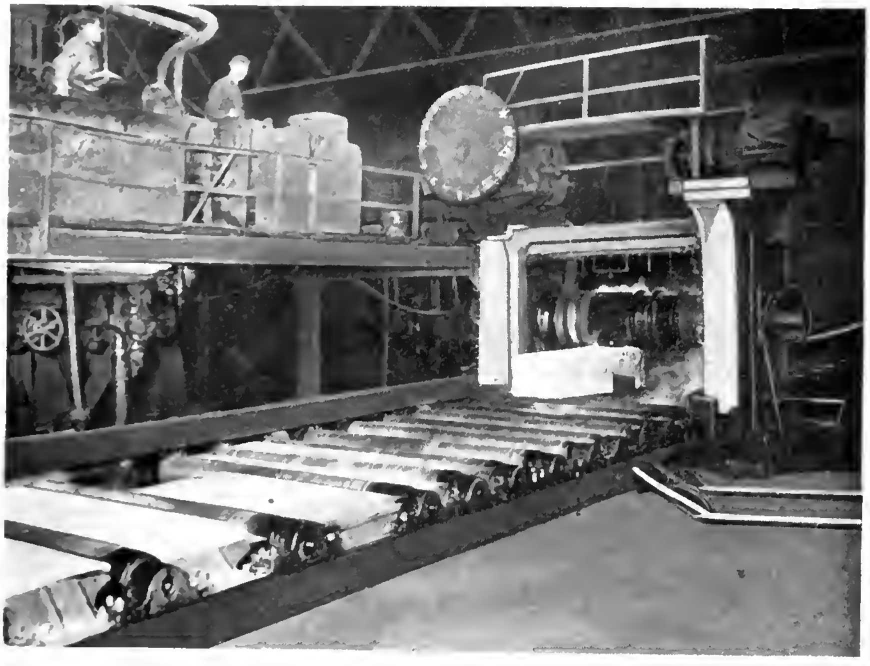
One hot saw for cutting ends off angles, bars, etc.

One vertical shears for shearing heavy billet stock, made by the Lewis Foundry Machine Co., Pittsburg, Pa.

One twister for twisting bars for reinforcing concrete, etc., made by Ransome Bros., and driven by a 60 h.p. continuous current motor of 220 volts, type.



WOBBLING A 28-INCH COGGING MILL ROLL ON HORIZONTAL BORING MILL IN MACHINE SHOP.



COGGING MILL SHOWING 3½ TON INGOT UNDER OPERATION.

One heavy angle shears made by Jones, Burton & Co., Liverpool, England.

One rail puncher by Jones & Burton.

One hot saw for cutting heavy shell stock, made by the Mesta Machinery Co., Pittsburg, Pa.

One hot billet shears for cutting rolls from 28 in. mill.

One Stirling saw for heavy shell stock, made by the George Gorton Machine Co., Racine, Wis.

One plate shears for shearing heavy plate made by E. W. Bliss Co., Brooklyn, N.Y., and driven by continuous current motor, supplied by the Canadian General Electric Co.

One "Little Bin" cutting-off machine for shearing 15 and 18 pdr. shell stock, and for shearing billets for No. 1 and 2 mills, made by U.S. Engineering & Foundry Co., Youngstown, Ohio, and driven by direct current motor of 50 h.p.

Bolts, Nuts, and Spikes

The spike department takes care of a daily output of 100 tons of finished spikes, each machine installed being capable of producing railroad, mine and other spikes of varied size and shape.

The bolt and nut department equipment is modern and up-to-date, and capable of producing 50 tons of finished material daily. All sizes of railway and structural bolts and nuts are made, enormous quantities being supplied to the

Canadian railways and the larger contracting firms throughout Canada.

The rivet department is equipped for a daily production of 50 tons of rivets of all sizes and styles required for structural work, tank, car, and boiler work, rivets for the latter conforming to Lloyd's and British Board of Trade specifications and requirements.

Lower Floor

The 540 ft. M. and S. building contains the 18 pdr. shell finishing department, and the bolt and nut department which is equipped as follows. All drives are by electric motors:—

Two tie plate punching machines, by Hilles & Jones, Wilmington, Del.

One thread and bolt machine, by Waterbury Farrel Foundry & Machine Co., Waterbury Conn.

Three thread and bolt machines by National Machinery Co., Tiffin, Ohio.

Five thread and nut machines, by the Acme Machinery Co., Cleveland, Ohio.

Five boring machines, by the National Machinery Co., Tiffin, Ohio.

One nut boring machine, by the Acme Machinery Co., Cleveland, Ohio.

One drill, by W. F. & John Barnes Co.

One tumbler for cleaning nuts, bolts and discs.

Three nut lathes, by the Acme Machinery Co., Cleveland, Ohio.

Five bolt-threading machines, by the Acme Machinery Co., Cleveland, Ohio.

One machine for rolling bolts, by the Waterbury Farrell Foundry & Machine Co., Waterbury, Conn.

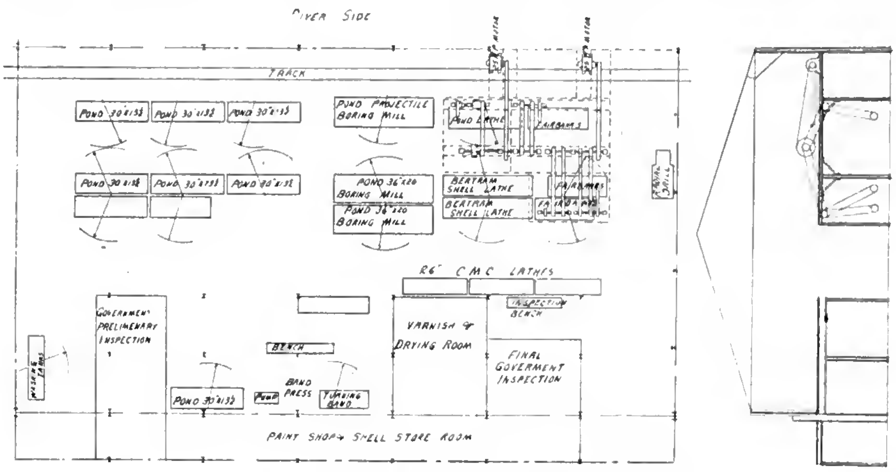
One bar shears for nuts and bolts, by the Badger State Machine Co., Janesville, Wis.

stock, with oil furnace in connection, by the Acme Machine Co.

Five bolt and rivet machines, by the Acme Machinery Co.

In the bolt and nut department, the following furnaces are installed:—

Two continuous rivet heating furnaces, each being 9 ft. by 24 ft.



MACHINE TOOL LAYOUT, 9.2-INCH SHELL SHOP.

Ten bolt and nut machines, by the Acme Machinery Co.

There is being installed one disc machine for 9 2 shells, by the Acme Machinery Co.

Departmental Machine Shop

The machine shop for this department contains one milling machine (No. 2.A.) by Brown & Sharpe, Providence, R.I.

One boring machine, by the John Bertram & Sons Co., Dundas, Ont.

One Champion drill, No. 20, by the Champion Blower & Forge Co., Lancaster, Pa.

Two 20 in. B.G. lathes, by J. J. McCabe. One Newton lathe.

Thirteen bolt and nut furnaces, 6 ft. by 10 ft.

Two pit spike furnaces, 5 ft. by 8 ft.

Spike Department

The spike department contains four continuous spike furnaces, 9 ft. by 24 ft., also the following machines:—

Two pit spike machines, by the National Machinery Co., Tiffin, Ohio.

Four railroad spike machines.

One tumbler for cleaning spikes and discs now working on shell stock.

Three disc boring machines, by the John Bertram & Sons, Dundas, On.

Two threading machines, by the Acme Machinery Co., Cleveland, Ohio.

Two burring machines, by the Acme Machinery Co., Cleveland, Ohio.

Roll Turning Department

The roll turning department contains one lathe for turning cogging rolls up to 28 in. diameter; three lathes, one of which was made by Miller & Co., Coatbridge, Scotland, the others being made at the plant. This shop is supplied with a 7½-ton Cleveland crane.

Box Department

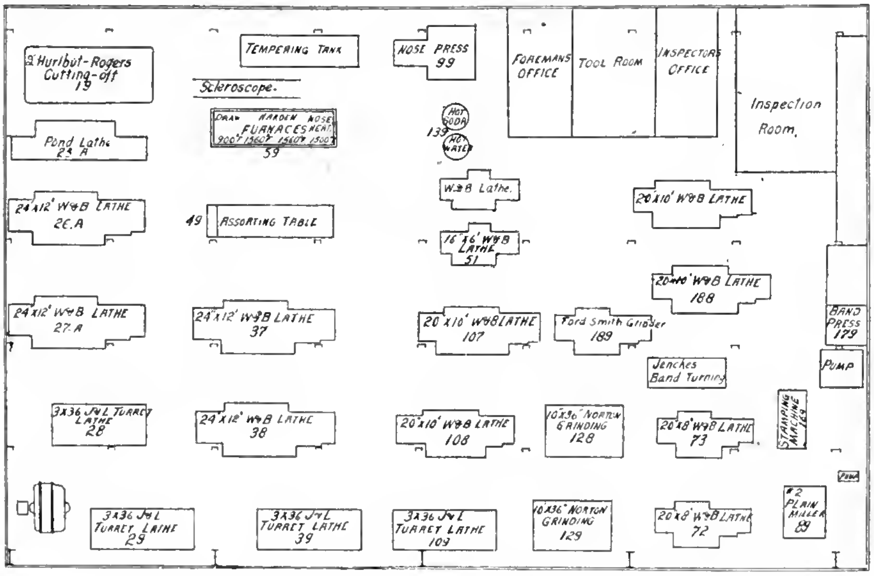
In the box department are manufactured the boxes in which bolts, nuts, and spikes, etc., are shipped. The shop is equipped as follows:—

One engine and boiler, by the Robb Engineering Co., Amherst. N.S., driving the following machines:—

One box nailer, by the Morgan Nailing Co., Rochester, N.Y.

One circular saw; two stainers.

One standard gauge, depressed railroad track for bringing in lumber, etc.



MACHINE TOOL LAYOUT IN 18-PDR. SHELL FINISHING SHOP.

Upper Floor

The upper floor contains:—One 4 in. header for 4.5 shells, by the Ajax Machine Co., Cleveland, Ohio.

One 3-in. header, for 18 pdr. shell

One surface grinder, by the Springfield Mfg. Co., Bridgeport, Conn.

Two general purpose lathes, by Schumacher & Boye, Cincinnati, Ohio.

One oil furnace, steel saws, etc.

Pattern Shop

The equipment in the pattern shop

consists of one 34-in. band saw, by John Bertram & Sons Co., Dundas, Ont.

One planer, by J. Fay & Egan Co., Cincinnati, Ohio.

One buz planer, by Goldie & McCulloch Co., Galt, Ont.

FINISHING A 25-FT. STEEL SHAFT IN MACHINE SHOP.

One swinging cut-off saw, by J. A. Fay Co., Cincinnati, Ohio.

One rip saw by the Egan Co., Cincinnati, Ohio.

One lathe, by J. A. Fay Co., Cincinnati, Ohio.

One knife grinder, by Chas. A. Strelinger, Detroit, Mich.

One stamping machine, by Williams & Wilson, Montreal, Que.

Heavy Forging Department

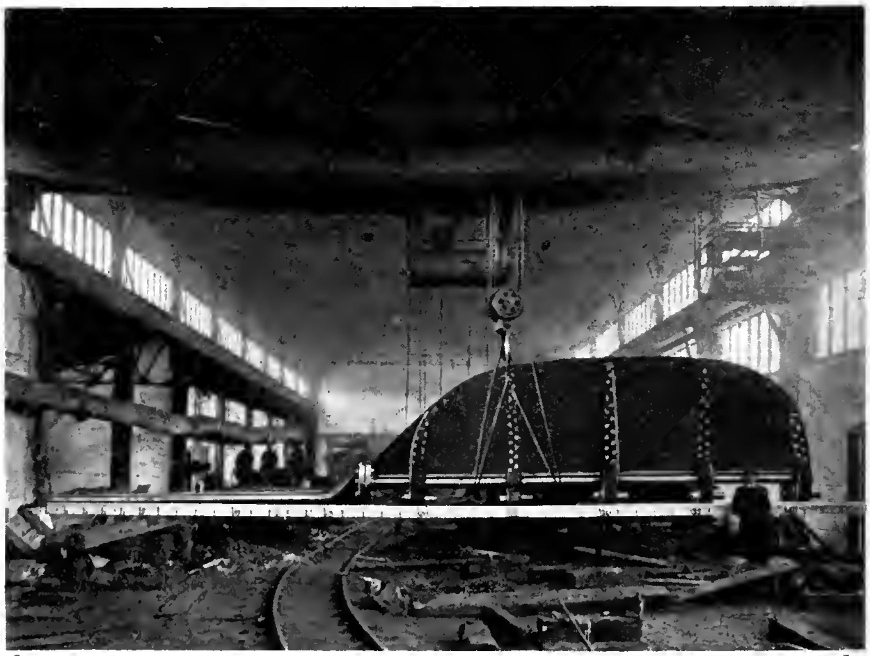
The equipment here consists of one 4,000 ton steam hydraulic press, and one 600-ton steam-hydraulic press. These are used for forging heavy pieces, such as rudders, crank shafts, etc., up to any weight. Two furnaces capable of heating 30 ton ingots are in close proximity to the 4,000 ton press. Return tubular boilers are installed over each furnace to utilize all the waste heat from the latter. Two smaller furnaces are used for the 600 ton forging presses, one furnace having one boiler over it.

Shell Forging Department

In the forge building there are installed six hydraulic shell presses built by C.P.R. for forging exclusively 18 pdr., 4.5 in., and 60 pdr. shells. The power of these presses is 268 tons. They are supplied with 1,500 lbs. per sq. inch water pressure by two accumulators 18-in. by 18 ft., manufactured by the R. D. Wood & Co., Philadelphia, and work in conjunction with six 19-30-5-24 Worthington pumps. The presses work in three 8-hour shifts. Six heating furnaces 8 ft. by 20 ft., equipped with American automatic stokers are used for heating the shell blocks for the above presses.

The boiler installation in the forge department consists of three 500 h.p. Stirling and two-400 h.p. Babcock & Wilcox water-tube boilers. These supply steam to six Worthington and three Wilson-Snider pumps. The capacity of the former is 170 water horse-power and of the latter, 290 water horse-power. The boiler gases pass into two steel self-supporting stacks.

Three accumulators supply hydraulic pressure to one 1,500-ton (with intensifier) and one 500-ton hydraulic presses, also to one draw-bench 18 in. by 12 ft., and to one draw-bench 18 in. by 18 ft. for forging 8 in. and 9.2 in. shells. They C. P. R. presses in shell forging department already mentioned.



RUDDER FOR SS. "GRYFERVALE." WEIGHT COMPLETE 22,000 POUNDS.

Two continuous furnaces, 5 ft. by 50 ft., heat 8 in. and 9.2 in. shell blocks for the 1,500 ton and 500 ton presses. The shell blocks are pushed in at the back of also supply hydraulic power to the six furnace by a hydraulic pusher and are taken out at front by continuation of the process. The shell blocks are next put through two operations on the presses upsetting and piercing, being afterwards transferred to the draw-bench, where they are drawn down to finished-forge size. The draw-benches were supplied by the Mesta Machine Co.

Axle Turning Department

The railway car axle shop is one of the most up-to-date in the whole plant, containing, it is claimed, the best railway car axle manufacturing equipment extant. This department produces, we understand, a greater daily and monthly output than any other works in the British Empire; besides there are believed to be no shops on the European Continent with an equal output.

The axles are, of course, products of the "fluid compressed" steel plant at Sydney Mines, thus the high standard of excellence for both freight and passenger cars. Axles, forged, rough or finish turned, are being manufactured at the rate of over 5,000 per month.

The axle turning department contains the following machines which are used meantime for turning shell stock of various sizes.

One Bridgeford axle lathe, now turning 4.5 in. and 5 in. shell stock.

Two 5 inch lathes, by Williams Tool Co., Erie Penn., engaged on 4.5 in. and 5 in. shell stock.

One 5 inch lathe on shell stock.

One 24-inch lathe, by Wm. Sellers & Co., Philadelphia.

One 24 inch lathe, by Lodge & Shipley Machine Tool Co.

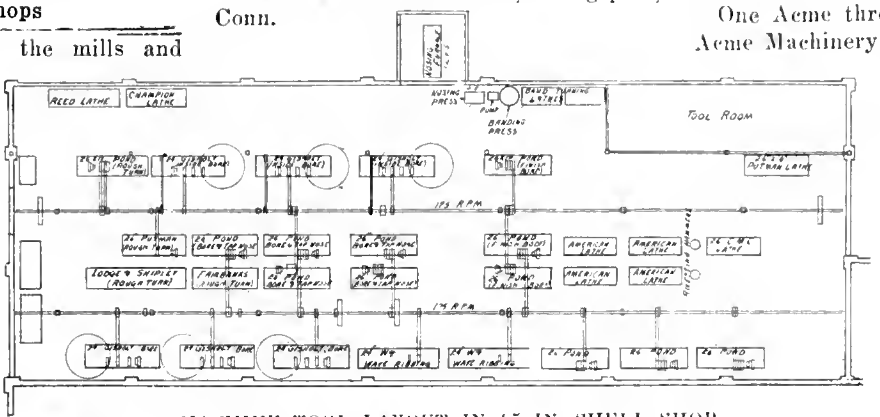
Three axle lathes, makers name not available.

One lathe, by Canadian Fairbanks-Morse Co., Montreal.

One Bridgeport lathe, and two other lathes whose makers' names are not available, also two cutting machines.

Machine Shops

In conjunction with the mills and heavy and light forge shops there are two large machine shops; one housed in the extension to the new forge building, equipped especially for turning up rough forgings and finishing the heavier classes of work, while the other is used on the lighter work. The list of machine tool equipment installed is as follows:—



MACHINE TOOL LAYOUT IN 4.5 IN. SHELL SHOP.

New Shop

One horizontal boring machine, by John Bertram & Sons Co., Dundas, Ont.

One drill, by John Bertram & Sons Co.

One boring machine for gear wheels, etc., by Herman L. Winterer, Philadelphia, Pa.

One Espen-Lucas, No. 2 saw for cutting shell stock.

One lathe, by the Fifield Tool Co., Lowell, Mass.

One lathe, by the A. R. Williams Machinery Co., St. John, N.B.

Two 45-inch lathes, for heavy rolls, shafting, etc., by Hulse & Co., Manchester, England.

One planer, by Loudon Bros., Johnstone, Scotland.

One Espen-Lucas saw for cutting heavy shafting, etc.

Two lathes by Niles-Bement-Pond Co., Pond Works, Plainfield, N.J.

Two lathes, type 3, No. 6, by the American Tool Works Co., Cincinnati, Ohio.

One Espen-Lucas saws for heavy shell stock.

The following makes of cutting-off machines are installed for operating on shell stock:

One Manning, Maxwell & Moore, New York.

Five Hurlbutt, Rogers Machine Co., South Sudbury, Mass.

One Gorton saw, size No. 2 B, by the George Gorton Machine Co., Racine, Wis.

One 50-inch diam. boring mill. John Bertram & Sons Co., Dundas, Ont.

One 10 ft. boring mill, by Smith & Coventry, Manchester, England, for large gears and rudder irons, etc.

Old Shop

The old machine shop contains the following:—One 36-inch boring mill, by the Baush Machine Tool Co., Springfield, Mass.

One 36-in. boring machine.

One boring mill, 50-in. diameter by the Bullard Machine Tool Co., Bridgeport, Conn.

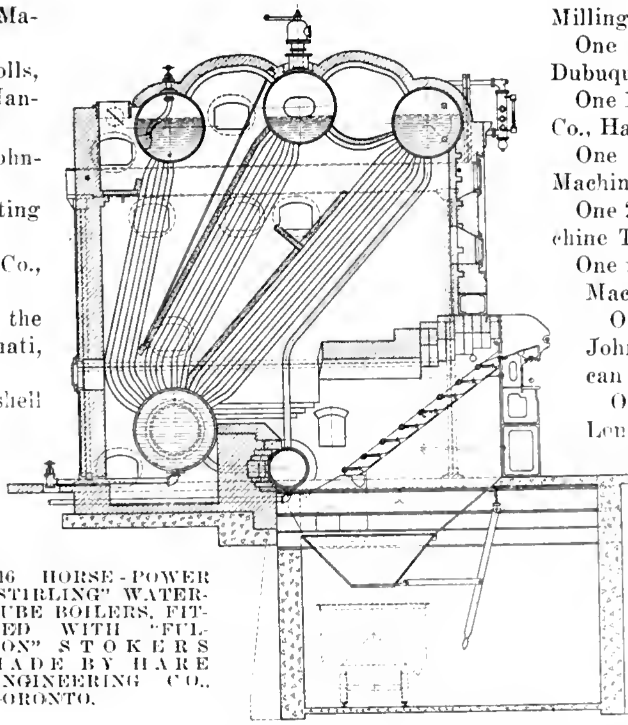
One finishing lathe, 20 ft. bed, by the John Bertram & Sons Co., Dundas, Ont.

One 24-inch lathe, 15 ft. bed, by the John Bertram & Sons Co., Dundas, Ont.

One planer for work up to 15 ft. by 5 ft., for planing bearings for hot saw, etc., by the John Bertram & Sons Co., Dundas, Ont.

One 16 inch lathe, by J. J. McCabe, New York.

One 22-inch Bradford lathe, by the Bradford Machine Tool Co., Cincinnati, Ohio.



316 HORSE-POWER "STIRLING" WATER-TUBE BOILERS, FITTED WITH "FULTON" STOKERS MADE BY HARE ENGINEERING CO., TORONTO.

One 20-inch Bradford lathe, The Bradford Machine Tool Co., Cincinnatti, Ohio.

One 19-inch lathe, by Flather & Co., Inc., Nashua, N. H.

One 56-inch Bertram lathe, 15 ft. bed, John Bertram & Sons Co., Dundas, Ont.

One 5 ft. (dia.) roughing lathe, by the New Haven Mfg. Co., New Haven, Conn.

One 4 ft. roughing lathe, by Bement, Miles & Co., Philadelphia, Pa.

One 20-inch lathe, by the London Machine Tool Co., Hamilton, Ont.

One Acme threading machine, by the Acme Machinery Co., Cleveland, Ohio.

One drill, by the John Bertram & Sons Co., Dundas, Ont.

One boring machine, by F. E. Reed, Worcester, Mass.

One saw grinder, by the Gigley Machine Co., New York.

One cutting-off machine, by the Higley Mfg. Co., New York.

One high duty shaper, by Gould & Eberhardt, Newark, N.J.

One radial drill, 8 ft. arm, by the John Bertram & Sons Co., Dundas, Ont

One drill press, by the Cincinnati-Bickford Tool Co., Cincinnati, Ohio.

One 16-inch lathe, by New Haven Mfg. Co., New Haven.

One key seater, by Baker Brothers, Toledo, Ohio.

One gear cutter, 60 in. dia. by 18 in. face, by the Cincinnati Gear Cutting Machine Co., Cincinnati. Ohio.

One milling machine, by the Cincinnati Milling Machine Co., Cincinnati, Ohio.

One gear cutter, by the Adams Co., Dubuque, Iowa.

One 14 inch lathe, by Pratt & Whitney Co., Hartford, Conn.

One 15 inch shaper, by the Hendey Machine Co., Torrington, Conn.

One 25 inch shaper, by the London Machine Tool Co., Hamilton, Ont.

One radial drill, 6 ft. arm, by the Pond Machine Tool Co., Plainfield, N.J.

One slotter, by T. Shanks & Co., Johnstone, Scotland, and one American shaper.

One grinder and planer, by the London Machine Tool Co., Hamilton, Ont.

One drill, by the John Bertram & Sons Co., Dundas, Ont.

One 22-inch lathe, by the John Bertram & Sons Co., Dundas, Ont.

One 18-inch lathe, by F. E. Reed, Worcester, Mass.

One 8-inch lathe, by the John Bertram & Sons Co., Dundas, Ont

One small lathe, by the John Bertram & Sons Co., Dundas, Ont.

One 18-inch lathe, by the Hill, Clarke Co., Boston, Mass.

One 18-inch lathe, by Chandler &

Farquhar Co., Boston, Mass.

One Niles-Bement-Pond lathe, 36 in. by 28 ft. bed.

One boring mill, by the Canada Machinery Corporation, Galt, Ontario.

The tool room equipment of the old and new machine shops consists of a shaper, by Gould & Eberhardt, Newark, N.J.; a milling machine, by the Rockford Milling Machine Co., Rockford, Ill.; a universal grinder, by the Walker Grinder Co., Worcester, Mass., and a 14-in. Lodge & Shipley lathe.

Ordnance Department

Shortly after the opening of the European war, a demand arose for shells of various types and sizes. To meet this demand the "Scotia" Company started at once the manufacture of suitable steel, made the blanks and rough-forged shell cases, the latter being shipped to different shell machining plants, both in Canada and Great Britain. The first shell made in Canada complete originated at the "Scotia" plants. With succeeding months, more and more orders for shells were placed in Canada, and not only were the quantities increased, but the sizes and types materially so.

In common with our metal-working plants generally, "Scotia" found it necessary to extend and add to its plant and equipment. As a result we find additional forge and machine shops erected and equipped with the latest tools and appliances for producing shrapnel and high explosive shells all the way from 15 and 18-pdrs. of the former, and from 4.5 in. to 12 in. of the latter. The accompanying tabulated statement of a twelve months' output of shells gives a fairly good idea of the facilities which the "Scotia" plant offers for the work.

At the present time production is getting under way relative to 6-in., 8-in. and 9.2-in. shells, right from the ore to the finished article.

18-Pdr. Shrapnel Shop

The machine tool equipment in this shop is driven for the most part by a 75 h.p. C.G.E. motor. In addition, a Ford-Smith grinder is driven by 25 h.p. Canadian Westinghouse motor, while motors of the latter make, 2½ h.p., 5 h.p., and 5 h.p., drive a cutting compound circulating pump, a grinder and shell burnisher, and the nosing press respectively. The various items of machine tool and other equipment installed are as follows:—Lathe, by Whitcomb & Blaisdell Machine Tool Co., Worcester, Mass.; heating furnace, by Tate-Jones Co., Pittsburgh; nosing press, by John Bertram & Sons Co., Dundas, Ont.; banding press and pump, by Richard Dudgeon Co., New York City; Bertram marking machine; plain milling machine, by Becker-Brainard Milling Machine Co., Hyde Park, Mass.; pump for circulating compound to cutting-off machines, by Smarter-Turner Co., Hamilton, Ont.; three Chapman Double Ball Bearing Co. trucks; Jenckes copper band turning machine; Hurlbut Rogers cutting-off machines; Pond lathes; Shore Scleroscope, etc. Tool room equipment consists of emery stone, vise, and hand tools only.

HEAD OFFICE, NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.

4.5-in. Shell Shop

Equipment installed in the 4.5-in. shell machining department includes one Bertram radial drill, one Champion lathe, one Putman lathe, one 16-in. American lathe, one 26-in. C.M.C. lathe, and one Rochester high-speed hammer. Three Chapman trucks are employed for transporting the shells about the shop. The varnishing of the shells is done in a special room outside the machine shop, and the varnish baking in a special oven made by the Renton Gibbs Co., Liverpool, England.

9.2-in. Shell Machining

For the machining of 9.2-in. shells, the following equipment has been installed: Two Niles-Bement-Pond 30 in. x 13 ft. 6 in. lathes for finish turning shell bodies; four ditto for finish boring and threading shell noses; one 26 in. Canadian Fairbanks-Morse single purpose lathe or finish boring and threading shell noses; two N.B.P. 30 in. x 13 ft. 6 in. lathes for base counterboring, threading and facing shells to weight; one No. 6 Bertram axle lathe wave ribbing and undercutting; three N.B.P. 36 in. x 20 ft. projectile boring lathes for inside bore of shells; one 36 in. x 14 ft. N.B.P. triple geared lathe for rough turning outside shell bodies; two Bertram lathes for rough turning outside shell bodies; three 26 in. Canadian Fairbanks-Morse single purpose lathes for preliminary rough turning or spotting; three 26 in. C.M.C. lathes for finish turning, etc.

The operations pertaining to the machining of 9.2-in. shells are as follows:—(1)—Cut off open end of forging; (2)—bore and face nose (6 ft. radial drill); (3)—rough turn; (3a)—preliminary rough turn; (4)—rough and finish bore; (4a)—preliminary rough bore; (5)—finish turn body; (6)—finish bore, face and tap nose; (7)—counterbore base, thread and face to weight; (8)—wave rib and undercut; (9)—wash; (10)—shop inspection; (11)—preliminary Government inspection; (12)—turn adapter; (13)—screw in adapter; (14)—press copper band; (15)—turn copper band; (16)—face off base with adapter in position; (17)—enamel interior of shell; (18)—bake enamel; (19)—mark shell; (20)—final shop inspection; (21)—rectify; (22)—final Government inspection; (23)—painting; (24)—boxing; (25)—shipping.

Other important departments and quite extensive contributors to the various production processes, as well as to the upkeep of the various plant structures, and the shipment of finished commodities, are the carpentry, pattern, structural and box-making shops.

The shipping and store room is of ample size to care for all finished products, being 850 feet long and 75 feet in width. This department, in common with the others, is equipped with powerful electrically-operated cranes sufficient to handle the various weights required.

Power Plant

In the power plant, nine Stirling boilers are installed, each of 350 horsepower. Five of the boilers are fitted with Fulton stokers, the remainder being fired by hand. A Williams feed regulator is installed. A Davidson pump, 14-

8¼-14, and a Weir pump supply water through a feed water heater to the boilers from a tank, which in turn is supplied by return water from skid pipes from the various heating furnaces, and from turbines and air compressors. This is supplemented by automatic supply pipe from water service direct. A Williams feed regulator is installed in the system.

In addition to the Stirling boilers there are six Matheson return tubular boilers in connection with the mill furnaces. These supply steam to the mills, also to the old and new power houses.

The old power house contains one d.c. 640 k.w., 230 volt generator, driven by a 150 h.p. Matheson engine.

The new power house contains two d.c. low pressure turbines, and a 500 k.w. Siemens generator of 230 volts, made by Daniel Adamson & Co., Dunkinfield, England.

One Robb engine, and a 50 k.w., d.c. generator of 200 volts, and 220 r.p.m., the latter made by the Canadian General Electric Co.

One high pressure turbine pump of 350 lbs. pressure, driven by low pressure turbine and of 3,200 r.p.m., for accumulator service.

Air pumps and 10 h.p. motor running 850 r.p.m., made by Daniel Adamson & Co., Dunkinfield.

Surface condenser in connection with low pressure turbines, made by Daniel Adamson & Co.

One set condenser for turbine driving high pressure pumps, made by Daniel Adamson & Co.

Three circulating pumps at shore for delivering water to condensers, made by Daniel Adamson & Co. These are driven by 40 h.p. motors running 1,040 r.p.m.

One pump for delivering condensed water to boiler tank; output being 72,000 gallons per 24 hours.

One ventilating fan driven by 7 h.p. motor.

One 5-ton Cleveland crane, operated by chains.

Two air compressors as follows:—No. 4131 with air cylinders of 13-21-36 and steam cylinders of 12-22-36, and No. 1560 with air cylinders of 14-14-22 and steam cylinders of 14-14-22, supplied in each case by the Canadian Ingersoll Rand Co., Sherbrooke, Que.

These compressors supply air to entire plant.

The plant is situated on the Intercolonial Railway of Canada, giving it direct connection by rail to all parts of the Dominion and the United States. Railway sidings extend into the various departments. On completion of the river improvements now in progress, the plant will be on tide-water, and will be accessible to 6,000-ton ships. The buildings cover an area of some 10 acres, and employment is given in normal times to over 1,000 men.

Welfare Work—Trenton Plant, New Glasgow

Every precaution is taken to render safe the working conditions of the men, and to provide first aid promptly to the injured should an accident unfortunately occur. First aid boxes have been provided in the different departments, and a well-equipped first aid room is always kept in readiness for the reception and treatment of those injured. The company also has a comfortable and well constructed ambulance at the plant for the conveyance of sick or injured to the Aberdeen Hospital or to their homes.

The hospital mentioned is modern, thoroughly equipped and manned. It is situated in the town of New Glasgow about two miles distant; and has a most efficient corps of physicians and nurses. Being in the centre of a large mining territory its maintenance is provided for by subscriptions from the workmen, the companies operating in the district, and other residents. From every workman at the steel plant a small monthly subscription is received, and, in return, during sickness or injury, free treatment for the subscriber and members of his family is provided.

A further example of the interest taken by the company in the welfare of its workmen is the Employees' Relief Fund which is administered by a joint committee consisting of representatives of the workmen and the management. A small monthly fee, varying in amount from 15 to 40 cents, is subscribed by every employee, the company adding to the amount a subscription equal to the total sum so subscribed. From this fund, weekly payments are made to a workman during his period of sickness, injury or quarantine, and a cash payment made to the estate in case of his death. It may also be mentioned that rest houses have been installed for the benefit of the men at convenient points about the plant.

Shells Forged to April 30, 1916

18 Pr. Shrapnel	2,933,166
15 Pr. Shrapnel	336,677
Total	3,270,000
4 5 in. High Explosive	1 085.415
60 Pr. High Explosives	105 075
Total	1,200,000

Shells Finished to April 30, 1916

18 Pr. Shrapnel	say 110,000
4.5 in. High Explosive	56,000
60 Pr. High Explosive	7,836

Miscellaneous Outputs, 1915

Coal, 618,103 tons, four coal mines being in operation at present time.

Iron ore mined, 125,069 tons.

Pig iron made, 73,110 tons.

Steel ingots made by Sydney mines, 97,072 tons.

Steel billets rolled, 76,082 tons.

"Scotia's" Shipbuilding Enterprise

In view of the recent utterances of Col. Cantley relative to Federal Government aid to already established and prospective shipbuilding enterprise in Canada, it is interesting to note that, while action along the lines indicated is still more or less an uncertain factor, there is no uncertainty as to what "Scotia" has planned to undertake in the creation of a steel shipbuilding industry in a plant adjacent to its New Glasgow steel mills. A vessel of 220 ft. in length is to be the pioneer of the new enterprise, and not only are the plans prepared, the shipyard surveyed and in process of preparation, the equipment for same ordered and the expert help engaged, but a contract has been awarded for the propelling machinery. The latter will consist of a 1,000 horse-power, De Laval marine type steam turbine, complete with double helical reduction gears, and will constitute the first installation of its kind on a Canadian-built vessel. The propeller speed will be 80 r.p.m. The vessel on completion will enter the "Scotia" Company's general freight service. The De Laval turbines are being supplied through the Turbine Equipment Co., Toronto, and we are advised that they will also furnish the condensing equipment, bilge and boiler feed pumps.

"Scotia" Directorate

The men directing "Scotia" are as might be expected prominent in a wide variety of successful industrial and commercial enterprise as a glance at the accompanying list indicates:—President and general manager, Colonel Thos. Cantley, New Glasgow, N.S.

Vice-president, Hon. J. D. MacGregor, Ex-Lieutenant-Governor of Nova Scotia, New Glasgow, N.S.

Vice-president, W. D. Ross, director Bank of Nova Scotia, Toronto, Ont.

J. Walter Allison, director Bank of Nova Scotia, Eastern Trust Co., Acadia Sugar Refining Co., etc., Hallifax, N.S.

James C. MacGregor, vice-president Eastern Car Co., president I. Matheson & Co., director J. C. Carmichael & Co., New Glasgow, N.S.

George F. MacKay, former manager Nova Scotia Forge Co., New Glasgow, N.S.

Robert E. Chambers, M.I.M.E., manager ore mines and quarries, New Glasgow, N.S.

Frank W. Ross, capitalist, Quebec, P.Q.

Lorne C. Webster, vice-president Quebec Railway, Light, Heat & Power Co., Montreal, P.Q.

Frank Stanfield, M.L.A., director Stanfield's, Ltd, Truro, N.S.

George S. Campbell, director Bank of Nova Scotia, director Eastern Trust Co., Halifax, N.S.

W. H. Chase, Wolfville, N.S.

A. F. Rendall, St. John's, Nfld.

N. Bruce McKelvie, of Hayden & Stone, Boston and New York.

The Man Behind the Industry

Col. Thomas Cantley has been general manager of the company since 1901, and has been with it since 1885. He became second vice-president in 1909 and president in 1915. It is no reflection upon previous managers to say that "Scotia's" greatest development has taken place since he assumed its management, but more of a tribute to his untiring energy and ability.

Col. Cantley was elected first vice-president of the Canadian Manufacturers' Association in 1915, and to be next to the top of such an important organization, with a membership of over 3,000 Canadian manufacturers, is no mean compliment to a man who has worked his way up from the bottom of the ladder. Col. Cantley has taken a leading part in the production of shells for the Allies, was made an honorary colonel in this connection, and is chairman of the Canadian Munition Resources Commission in Canada.

Like many others, of our prominent industrial and business men, the Colonel started his first job when 15 years old, as a messenger with the Western Union, and when the Intercolonial Coal Co., at Westville, built a telegraph system connecting the collieries, railway and wharves with the Western Union system, he became their first telegraph operator. Later, he went into a general merchandise business which he abandoned in 1885 to take up the work of sales agent of the Nova Scotia Steel Co. Step by step, he rose in the estimation of the executive, also in position, becoming in turn, secretary, assistant manager, joint manager, director, and holds the dual appointment of general manager and president of the company. He is a practical man in every sense of the term having not only a thorough knowledge of the steel industry, but what is equally important, of his company's position and possibilities.

Col. Cantley was born in New Glasgow, N.S., and not believing that far away fields only are green, stayed in Nova Scotia. He has probably half-a-dozen suit cases well spattered with labels, as he has spent much time in Great Britain, Germany, Norway, Sweden, Austria, Italy, France, Cuba and other countries. Between 1895 and 1900, he introduced Wabana iron ore abroad, more than 2,000,000 tons being so exported. That trade having ceased on account of the war, Col. Cantley has been hustling with the typical enterprise of the maritime province people, to find new export markets and openings for the products of his progressive corporation.

Col. Cantley has several valuable helpers, other than those on the directorate. A. McCall, secretary commercial manager, has been with "Scotia" for over a score of years, and is familiar with every phase of its commercial activities. Major Cantley, who spent about eleven months with his regiment, the Fifth Royal Highlanders, somewhere in France, was recalled by the Minister of Militia and seconded for special duty in connection with munition work. Since his return, he has been responsible for all munition work of the "Scotia," in addition to filling the position of assistant general manager of the whole enterprise. H. B. Douglas is manager of the Eastern Car Co., and has his end of the business in excellent shape to handle the large orders which are expected in the future. During the past year, Mr. Douglas and his men have been busy in filling orders for cars for the Russian and French governments.

Directors' Report—Year 1915

At the annual meeting of shareholders of the Nova Scotia Steel & Coal Co., held at New Glasgow on March 20, the directors submitted the fifteenth annual report and statement of assets and liabilities, with abstract of profit and loss, for the year ended December 31, 1915.

Col. Cantley in dealing with the operations of the preceding year, 1916, said that during the past 30 odd years in which he was privileged to be connected with the Scotia Company, the corporation and its management had passed through some anxious and trying periods, but in all his experience he could not recall a year where the issues involved in the fluctuations and departure from normal conditions were anything like so great as during 1915.

Of the staff and other employees of the company there have volunteered for military service in various units, 721 men, while a considerable further number are enrolled in the permanent Canadian militia. These figures are equivalent to about 40 per cent. of those in the employ of the company of military age, and it is doubtful if any corporation in Canada has provided a larger number of recruits in proportion to its staff.

The company has made considerable sacrifice in this loss of officers and men, but the policy of the board has been that, although the management is being hampered and the operations of the company greatly handicapped, no restrictions should be placed in the way of enlistments. On the contrary, soon after the outbreak of war it was by a formal resolution of the board decided that all employees of the company volunteering for service in the armies of the Empire or the Allies should on their return from active service be again given employment by the company, even should it necessitate the retirement of others who had entered the company's service subsequent to that date.

The year 1915 brought to the management and staff, particularly at New Glasgow, many new problems and made heavy demands on the operative engineering and executive staff, many of whom worked long hours under heavy pressure and are entitled to very great credit for the character of the service rendered and the success attending same. A strong feeling of optimism prevailed among the large number of shareholders present and they were not only enthusiastic about the outcome of the past year, but looked forward with an eye of optimism toward what the future has in store for their well-managed and well-equipped organization.

The accompanying table shows the ore shipped by "Scotia" from the Wabana mines from 1895-1915:—

Year.	Tons per year	Tons to date
1895	2,400	2,400
1896	35,900	38,300
1897	45,387	83,687
1898	101,127	184,814
1899	302,784	487,598
1900	127,791	615,389
1901	342,638	958,027
1902	422,906	1,380,933
1903	343,227	1,724,160
1904	245,933	1,970,093
1905	308,044	2,278,137
1906	387,841	2,665,978
1907	346,496	3,012,474
1908	312,795	3,325,269
1909	460,387	3,785,656
1910	516,651	4,302,307
1911	516,334	4,818,641
1912	484,472	5,303,113
1913	623.037	5,926,150
1914*	249,957	6,176,107
1915*	190,060	6,366,167

*Shipments during these years were reduced on account of the war.

The directors are each of them men of ability and enterprise and are well known in Canadian business and financial spheres. The future success of Scotia will more than anything else depend as in the past on the calibre of the men who manage its affairs, and just at the moment there is little likelihood of any backsliding making itself evident. The outlook for the remainder of the present year, at least is of the brightest possible description.

Icebreaker Launch Marks St. Lawrence Navigation Epoch

Staff Article

Just to what extent the work of the new and powerful ice-breaker "J. D. Hazen" will be able to compress the ice-bound season of navigation on the St. Lawrence River is at present more or less problematical. Her advent is, however, a step in the right direction, and, if followed up, cannot fail to effect in the direction indicated a very material improvement on the conditions hitherto existent on that great highway of trade and commerce.

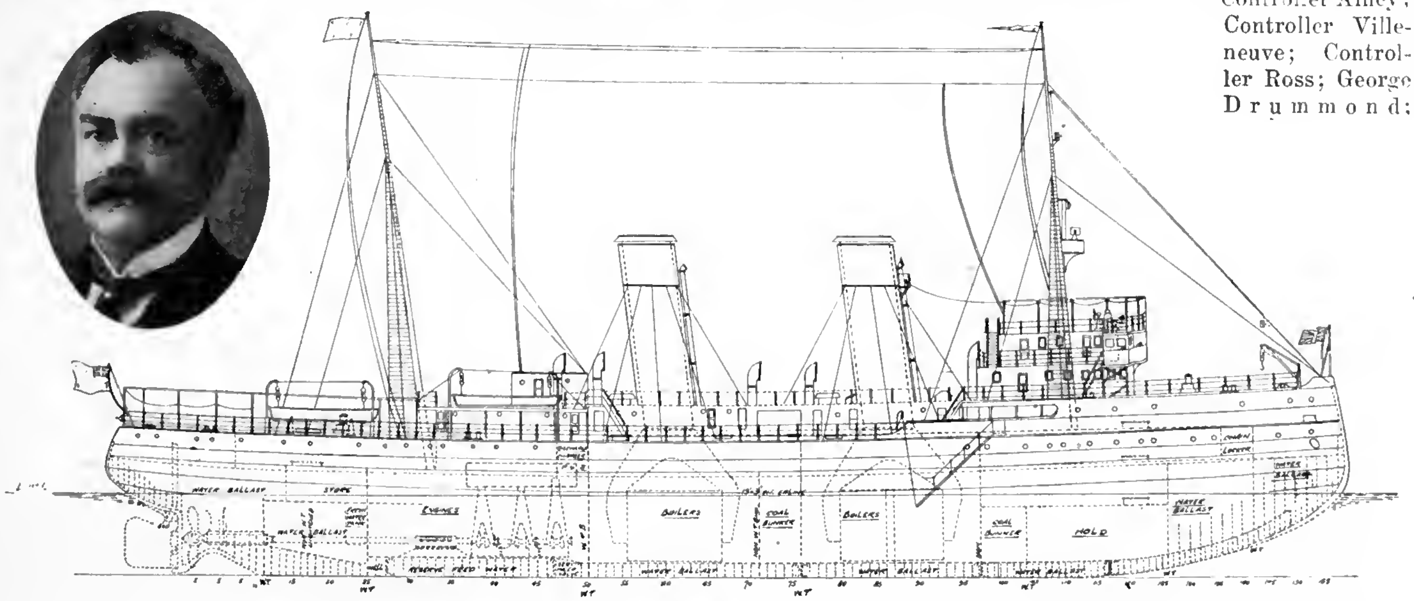
THE launch of the Dominion Government icebreaker, J. D. Hazen, on Monday afternoon, May 15, from the shipyard of Canadian Vickers, Montreal, was an event of more than ordinary importance. True it is that the major significance attaching to it appealed particularly to the residents of our Metropolitan City, and to those of the cities and townships located on and about the shores of our great ocean highway—the St. Lawrence River. Notwithstanding, the circumstances were such as to produce a stimulating effect even now as in the days to come, on the whole agricultural, industrial and commercial life of this far-flung Dominion.

LADY BORDEN,
Wife of Canada's Prime Minister, and who christened the vessel.

The building and conspicuously successful launch of the J. D. Hazen in this war time, when other and just slightly more urgent service commodities must be given preference, is an achievement of which the builders may well be proud. Further it should be remembered that steel shipbuilding and marine engineering have never been over-robust in Canada—thanks in large measure to lack of interest, because lack of intelligent appreciation by responsible governments of not only our national requirements in the matter but of the latent possibilities in our manhood awaiting the opportunity to achieve something worth while in a world sense in these two spheres. Lack of skilled labor due to the intermittent nature of shipbuilding within our borders has always had to be contended with, and in recent months has become trebly acute through the absorption of our manhood for overseas Empire military service.

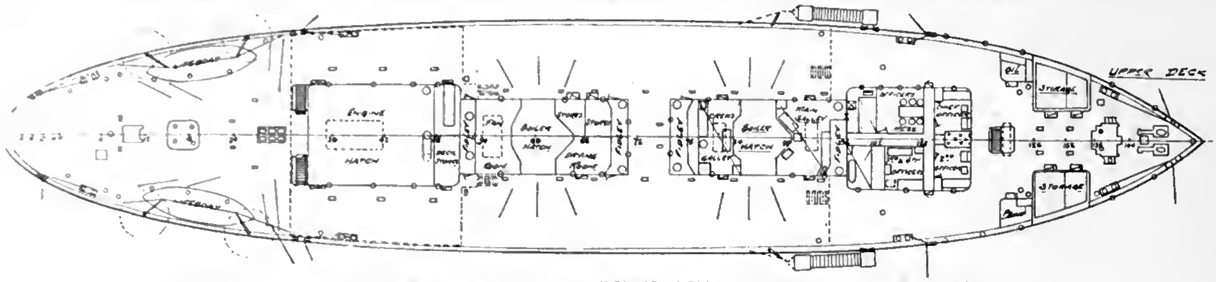
As befitted the occasion, the launch of the first real seagoing ship, not only from the plant of Canadian Vickers, but from the port of Montreal, a large and influential party of ladies and gentlemen was present on invitation of the vessel builders, among whom we noticed the following:—

Sir Robert and Lady Borden; His Honor the Lieutenant-Governor of Quebec and Mrs. LeBlanc; Mr. and Mrs. W. G. Ross; Ald. Hushion, representing the Mayor of Montreal, and Mrs. Hushion; Chief Justice Archibald; G. Bury, vice-president Canadian Pacific Railway; Brig-General Sir Alexander Bertram; Lady Williams-Taylor and Miss Brenda Williams-Taylor; D. Lorne McGibbon; Jas. Carruthers, director Can. Vickers; R. C. Smith, K.C.; Aime Geoffrion, K.C.; Mrs. R. Chaplin, Brig- General and Mrs. E. W. Wilson; Mr. and Mrs. J. G. Lewis; Sir Charles Gunning; Hon. and Mrs. C. J. Doherty; Serge de Liktascheff and Madame Liktascheff; Senator and Mrs. J. P. B. Casgrain; C. C. Ballantyne; Smeaton White; Miss de Salaberry; Mrs. G. W. Cook; J. W. McConnel; F. Orr Lewis, president Canadian Vickers; Brig-General A. E. Labelle; Farquhar Robertson; Mayor Seath; M. P. Fennell, jr.; Ludger Gravel; J. N. Cabana; Dr. W. H. Atherton; Dean Adams; Sir Herbert Holt; S. W. Ewing; ex-Controller Wanklyn; Hon. Jeremie Decarie; Sir William Petersen; Controller Ainey; Controller Villeneuve; Controller Ross; George Drummond;



CANADIAN GOVERNMENT ICEBREAKER "J. D. HAZEN," WITH PHOTO OF MINISTER OF MARINE AND FISHERIES INSET.

Hon. W. S. Fielding; ex-Ald. L. A. Lapointe, M.P.; Colonel Starke; P. V. G. Mitchell; W. G. Annable; Captain

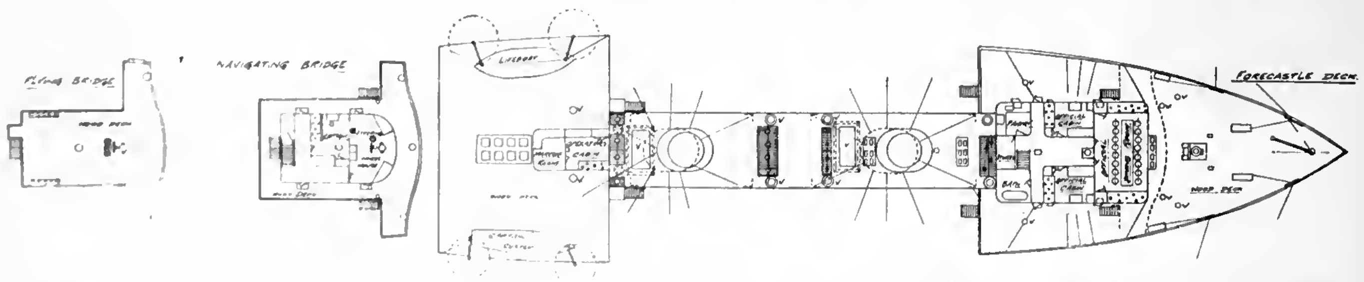


GENERAL ARRANGEMENT OF UPPER DECK, ICEBREAKER "J. D. HAZEN."

Bourassa; Lieut.-Col. Magee; Robert Reford; F. J. McClure; W. A. Coates; Sir John Kennedy; Ald. W. G. M. Shepherd; P. L. Miller, shipyard manager, Can. Vickers; Edgar McDougall; Herbert Ewan; Mr. and Mrs. J. H. Rodgers; John S. Leitch, Collingwood; O. E. Champagne; James French, New York, principal surveyor of Lloyd's Registry, United States and Canada; H. Driver, Secy. Can. Vickers; Thomas Hall; Cecil Doutre, commercial manager Can. Vickers, and Peter Bain, editor Marine Engineering of Canada, etc.

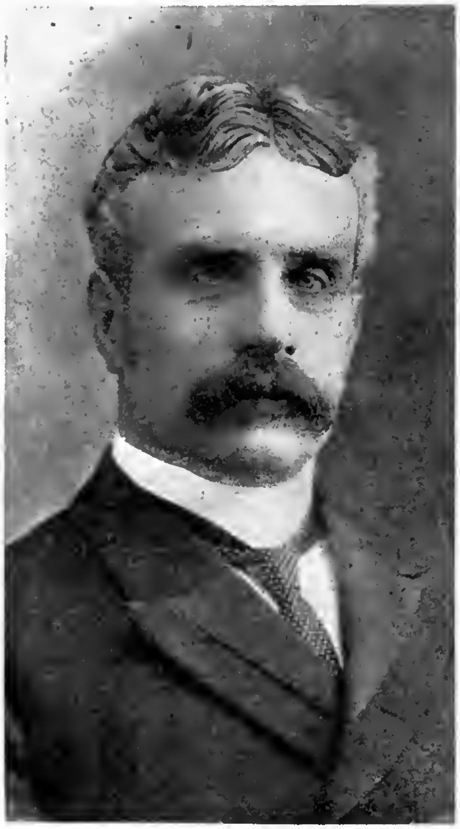
Lady Borden, wife of Sir Robert L. Borden, Canada's Prime Minister, performed the christening ceremony as the vessel began to move towards her native element, the ease and grace with which the little function was marked being indicative of the vessel's part in taking the water a few seconds later. Immediately following the launch, the J. D. Hazen was taken alongside the builders' wharf to receive her engines and boilers and be fitted out for service, the invited guests in the meantime adjourning to the shipyard molding loft which had been tastefully decorated for the occasion. Here refreshments were served, and some more than usually significant speeches made by F. Orr Lewis, president, Canadian Vickers, and by Sir Robert L. Borden, our Prime Minister.

Mr Lewis pointed out the now exceptional opportunity for Canada to start on the way to become a great shipbuilding nation, and the Premier in his response stated it was the policy of the Government to lend every reasonable assistance in competing with the long-established yards of older countries, including the United Kingdom.



GENERAL ARRANGEMENT OF FORECASTLE DECK, FLYING AND NAVIGATING BRIDGES, ETC., ICEBREAKER "J. D. HAZEN."

At the end of Mr. Lewis' address, he presented Lady Borden, as a souvenir of the occasion, with a gold neck chain, to which was attached a specially large diamond. Lady Borden made graceful acknowledgement of the gift.



RT. HON. SIR ROBERT L. BORDEN,
Who was present at the launch and spoke at the reception following.

F. Orr Lewis in his address reminded his auditors that a few years ago the site of the building in which they were gathered had been a part of the River St. Lawrence, from which more than 36 acres had been reclaimed by dredging.

He thanked Sir Robert and Lady Borden for coming, and paid a tribute to the present and previous Ministers of Marine and Fisheries, to the present and previous harbor commissioners and engineers of Montreal, and to P. L. Miller general manager, and his staff, for the zeal and great ability which had marked the construction and launch of the new icebreaker. He spoke of the work already accomplished by the shipyard plant in repairing one of His Majesty's cruisers, and in constructing ten other important vessels in a shorter time than had ever before been known.

Mr. Lewis pointed out that Canada has (potentially at least) in her steel, coal and timber all that is necessary to enable her to rival the results of which the Americans are so justly proud. Preparations he said should be made immediately to secure for Canada a portion of the enormous shipbuilding business which, as a result of war, will go to those ready to undertake it. After the war would be too late. John Leyland had placed the loss of British tonnage since the war began at 3,300,000 tons of all denominations.

"It is perhaps an open secret that when this yard was established, it was with the undertaking that as soon as we were ready we would have the building of naval ships," said Mr. Lewis. "Our alliance with one of the greatest, if not the greatest, shipbuilding companies in the world places us in the most favorable position to undertake the work, and if naval and commercial shipbuilding could proceed side by side, there is no doubt that within a short period of years the question of price, as between Canada and the older countries who have been building ships for generations past, would be satisfactorily solved."

Premier's Speech

Sir Robert Borden in his speech referred to the great war as one not only between armies engaged but between the industrial resources of the Allies and those of the Central Empires. In both capacities Canada had surpassed not only the expectations of her people, but the expectations of the world outside. After eulogizing what Canadians had done on the battle field, the Premier also praised the patriotism, skill and adaptability of those who organized Canadian industries and managed them so that they have been of such benefit to the Empire.

"The ship which has just been launched to-day is an example of the efficiency of these works," said the Premier, "and also of their scope and the efficiency of the management. I congratulate most sincerely not only the company, but the whole Canadian

Nova Scotia. He saw no reason why Canada should not go forward to the undertaking of building steel ships, and why she should not rival in the future the record made by Nova Scotia in the past in building wooden vessels.

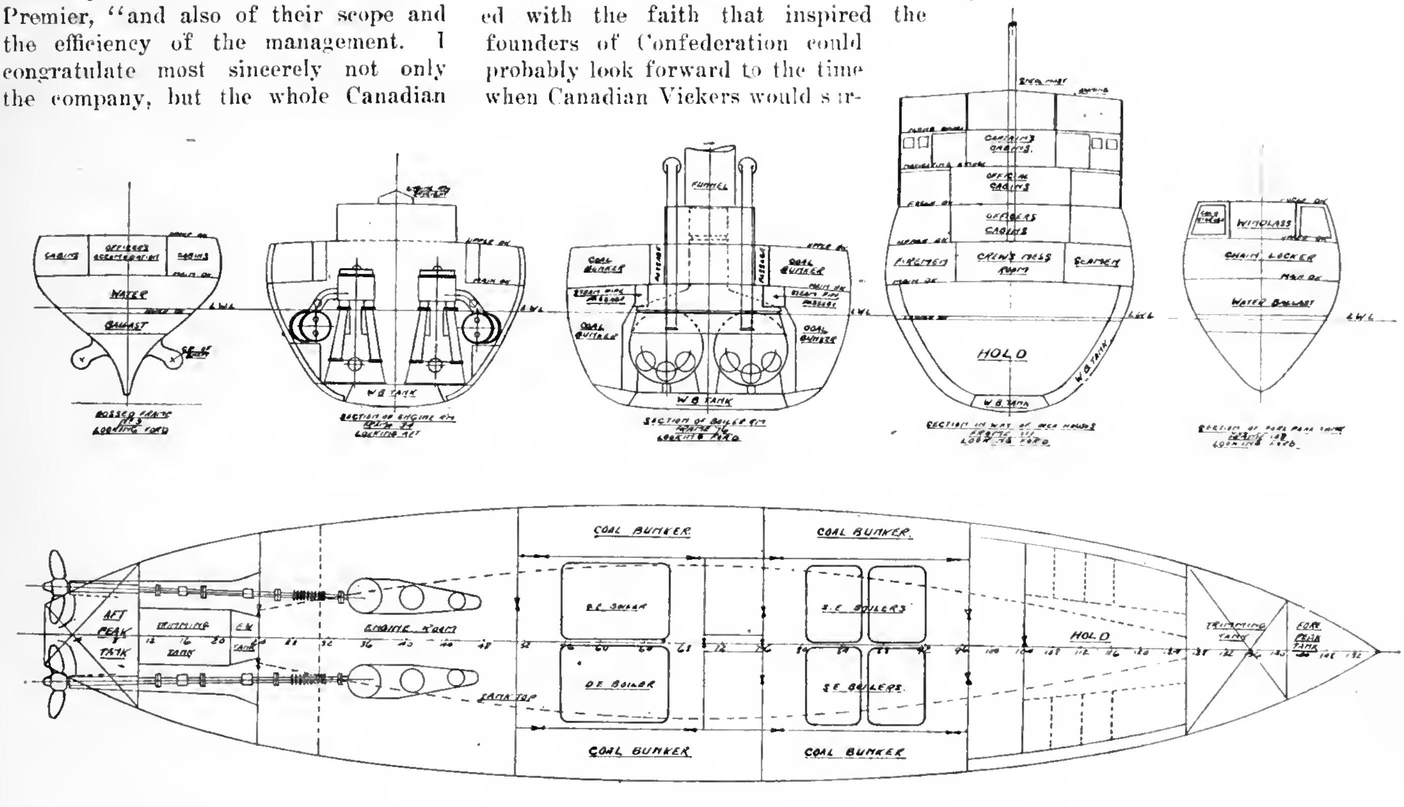
Sir Robert quoted a remark made to himself in Great Britain by the manager of one of the greatest shipbuilding concerns there, that, as the years roll by, the cost of building steel ships in Canada will more and more approximate to the cost in the United Kingdom.

"One man told me," said the Premier, "that in the next twenty years the cost in Canada will not be greater than the cost in the United Kingdom."

The Premier said that those inspired with the faith that inspired the founders of Confederation could probably look forward to the time when Canadian Vickers would sur-

war occur. He thanked Mr. Lewis for the splendid example given Canadians as to what could be accomplished with Canadian resources, coupled with the experience and knowledge which had been built up through such a long period in the United Kingdom. He referred, in closing to the hope of all that victory would come soon and that the preservation of the liberty and institutions of Canada, the Empire, and the world would be assured by a peace at once honorable and triumphant.

Hon. C. J. Doherty, Minister of Justice, thanked the Canadian Vickers, Co., for the opportunity afforded those present of seeing a noteworthy event in Canadian annals. Mr. Orr Lewis responded briefly.



HOLD PLAN AND SECTIONAL ELEVATIONS OF ICEBREAKER "J. D. HAZEN."

nation that this ship has been turned out in the short time available. I believe she has been on the stocks some time, but the work on the ship launched to-day had to be postponed for important reasons which may not be mentioned here. It is possible that this ship may be applied to some purpose connected directly or indirectly with the carrying on of this war and the furnishing of supplies. If such should be the case, and indeed in any case, the company are to be congratulated for a work which will be in the cause of Empire and the Allied Nations."

Referring to Mr. Lewis' remarks on shipbuilding, Sir Robert spoke of the ancient pre-eminence of Canada in this regard, more especially to what had been done in his native province of

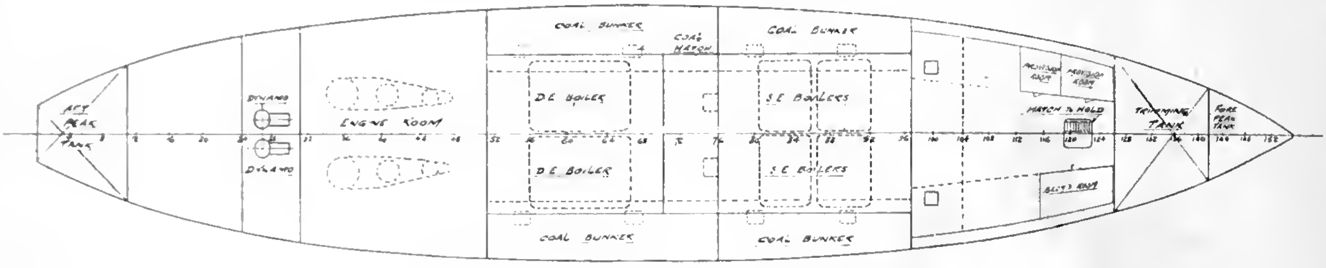
pass the parent from which it had sprung and when Canada would have a shipbuilding industry equally as great as that in the United Kingdom. "I am sure that both political parties are thoroughly in sympathy with that development," said Sir Robert, "and I am absolutely confident that both political parties in Canada will be willing to pledge themselves to give all reasonable assistance to help bring about that end."

The Premier then pointed out that other enterprises would derive benefit from a flourishing shipbuilding industry the requirements for building, fitting out and commissioning a vessel being many and varied. The development here of a large shipbuilding industry would also be a great asset to Canada and the Empire should another great

In addition to those specially invited to the launching ceremony and subsequent reception, and who were conveyed to the shipyard by special train on the Harbor Commissioners railway tracks from the foot of McGill Street, several thousand more or less privileged people were admitted to points of vantage inside the shipyard from which a view of the icebreaker as she glided into the water could be comfortably had. Work in every department of the plant ceased at noon on the day of the launch to give the employees opportunity of being present at the unique function. A pleasing feature of the arrangements made for taking care of and giving guidance to the invited guests and others was the distribution of 85 members, 53rd Montreal Boy Scouts

(Vickers troop) under command of Scout-Master Costain, along the line of approach to the vessel while on the ways, and to the reception hall. Sixty of the boys are employed at the works, and the majority are sons of employees as well.

On conclusion of the whole proceedings the invited guests were taken by

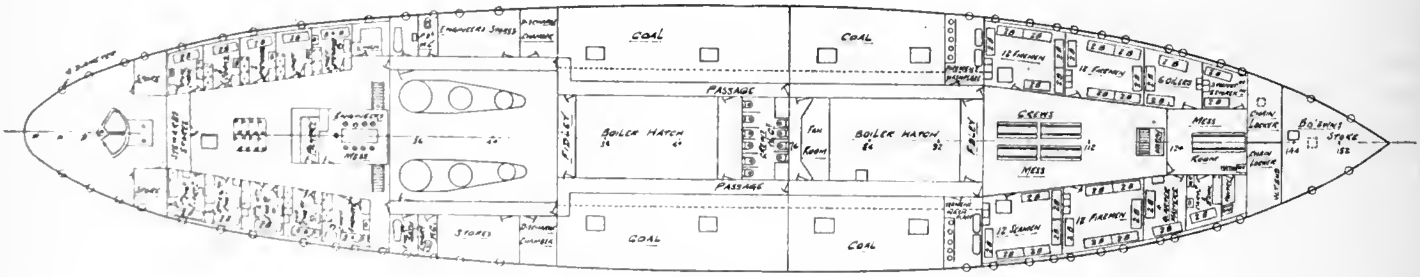


LOWER DECK PLAN, ICEBREAKER "J. D. HAZEN."

train to the opening ceremony in connection with the extension to Harbor Commissioners Elevator No. 1, concerning which an account is given elsewhere in this issue. It should also be added that each invited guest, during the reception proceedings was the recipient of a handsomely illustrated souvenir booklet, briefly descriptive of the new icebreaker.

Vessel Particulars

The hull, as is usual in vessels of this type is of extra strong construction, every advantage having been taken of the wide experience possessed by the builders to insure satisfactory service under exceptionally severe conditions. The vessel is intended for ice-breaking purposes only and will probably be laid up during the open season. Steel construction is adopted throughout the hull which is sub-divided into watertight compartments by seven transverse bulk heads to the height shown in profile. The hull bottom is of the double cellular type, and extends from frame 25 to frame 126, the space being used



MAIN DECK PLAN, ICEBREAKER "J. D. HAZEN."

for carrying water ballast, a portion of which, however, of about 90 tons capacity is reserved for feed water storage purposes.

The stem is formed of a massive steel casting, raked aft, and the stern is of the cruiser type which facilitates navigation amongst ice. Complete equipment is provided for pumping purposes, each compartment being fitted with steam and hand operated pumps. The rudder frame is an extra heavy steel casting, while the trunk is of .46 in. steel plate securely riveted to the stern framing, with cast steel stuffing boxes having brass glands. All side plates are 20 lbs. per sq. ft., the inner space being filled with well—seasoned fir closely fitted and bedded in white lead.

Watertight construction is used in the side bunker walls to the height of the upper deck, these, with the inner skin between the forepeak and the forward bulkhead, forming a double skin extending aft to the boiler room bulkhead. A 10 ft. deep ice belt is fitted at the water line, extending the entire length of the hull, the thickness forward being $1\frac{1}{8}$ in., and 1 in. aft. Plating of $1\frac{1}{8}$ in. thickness is used in the forward part of the hull while from the bottom of the ice belt to the keel plate for some distance aft, a 1 in. thickness is used.

Success to the "J. D. Hazen" and all who sail in her. May she prove a credit to her builders and to Canada, the land of her birth. —Lady Borden.

Two steel masts are fitted, the topmasts being of Oregon pine telescoped, and the whole supported by wire ropes galvanized and covered.

Propelling Machinery

Two sets of triple expansion surface condensing engines are fitted, the cylinder diameters being 28 in. 46 in. and 75 in. x 48 in. stroke. The valve gear is of the double eccentric link motion type, all wearing surfaces being extra large and well lubricated.

Forged steel is employed for all moving parts such as valve spindles and eccentric rods, while the connecting rods are of extra heavy construction to withstand the stresses resulting from shocks during ice-breaking operations in winter.

Particular attention has been given to the crank shafts which are forged from "fluid-compressed" steel, the webs being shrunk on to the shafts and crankpins, and secured by turned dowels driven half into webs. Each complete shaft is composed of three interchangeable lengths, connected by solid flanged couplings; the thrust and propeller shafts are of similar material. All working parts of the machinery possess a degree of strength varying from 35 per cent. to 60 per cent. in excess of Lloyds' requirements.

Boilers

These are of the Scotch type, two being double-ended and four single-ended units of 15 ft. 6 in. diam., the former 21 ft. and the latter 12 ft. long. The total heating surface amounts to 21,900 sq. ft. and the grate area, 560 sq. ft. The boilers operate under forced draft, and supply steam at a pressure of 180 lbs. per sq. in. enabling the engines to develop 8,000 indicated horsepower when running at a speed of 100 revs. per min. The bunker capacity is designed for 1,300 tons of coal.

Auxiliary Equipment

A complete electrical installation is fitted, the 110 volt, A.C. generator being in duplicate, and driven by compound high speed engines, running 500

revs per min. A 24 in. searchlight is provided for observation purposes, and a wireless equipment is to be installed by the Canadian Marconi Co.

Engine room communication with the navigation bridge is provided by Chadburn's (Ship) Telegraph Co., the instruments being of the latest type: illuminating, repeating, and tell-tale.

Ventilation, steam heating, hot and cold water services throughout are provided to withstand rigorous climatic conditions. Four 26 ft. lifeboats and one captain's cutter provide life-saving apparatus in compliance with law, for the ship's crew of 90 officers and men. Engineers' and stewards' quarters are on the main deck, the crew and petty officers being quartered on the forward part of the same deck, while officers' quarters and mess-room are located at the forward end of the upper deck casing.

Dimensions

Following are the principal dimensions of the vessels:

Length overall	292 ft.
Length between uprights	275 ft.
Breadth moulded	57 ft. 5 in.
Depth moulded	32 ft.
Draft mean	19 ft. 3 in.

Deadweight on above draft with coal stores and crew, about 950 tons.

ICE-BREAKER LAUNCH PROMPTS SHIPBUILDING AID DEBATE

ON a motion to go into supply in the House of Commons, Ottawa, on May 16, E. M. MacDonald, of Pictou, brought up the question of shipbuilding in Canada. He referred to the statement of Sir Robert Borden at the launching of the new ice-breaker at the Canadian Vickers yard, Montreal, that the Canadian Government favored subsidizing the shipbuilding industry. It was not so long ago, said Mr. MacDonald, that the idea of building of steel ships in Canada had been proclaimed an absurdity by the Government. Now it had been demonstrated that as Canadian manufacturers could make shells, submarines and ice-breakers, in like manner they could make steel ocean-going vessels. The Pictou member did not favor assisting the construction of wooden vessels. In conclusion, he pointed to the present scarcity of tonnage as a reason for the immediate encouragement of shipbuilding, and said he had no doubt the scarcity would for a long time exist after the war was over.

Sir Robert Borden replied that he was not aware that Canada's ability to build steel merchant ships had ever been questioned. A country with Canada's resources must ultimately engage in the construction of steel ships. Mr. MacDonald had appeared to confuse the development of a Canadian shipbuilding industry with the present scarcity of tonnage due to the war. Sir Robert said that he had found no one in Canada prepared to construct steel ships within a period which would render them useful in the present condition of vessel scarcity. He doubted whether it would be any advantage to begin the construction of steel vessels now when the cost was at its peak, in view of the fact that they would not be available when tonnage was most needed. After the war was over, the Prime Minister thought, there would be less cargo for vessels to carry, and owing to the release of vessels now interned there would be many more ships to carry it. Sir Robert said he had been informed that the cost of building steel ships in England and Canada would in twenty years be approximately the same.

Hon. Wm. Pugsley said that Canada ought to proceed at once to encouragement of shipbuilding, but unlike his confrere from Pictou, he was in favor of assisting the construction of wooden vessels.

Sir Thomas White said that the tariff had evidently been framed to help the shipbuilding industry, but a protective tariff would not be sufficient. There would have to be a bounty extending over a period of years. The encouragement of shipbuilding was much to be discussed, but it seemed at the present time that if shipbuilders were not now encouraged by the present high prices and high freights to construct vessels they would not be by a bounty. The Finance Minister said that the Government was entirely in sympathy with the idea of encouraging shipbuilding in Canada and of adding vessels to Canada's merchant marine.

Sir Thos. White, answering a question of Mr. Macdonald, said the War Measures Act was wide enough to allow the Government to deal with that part of the problem which had reference to the shipping situation.

F. ORR LEWIS, PRESIDENT CANADIAN VICKERS, LTD.

ADMINISTER HALF THE WORLD'S SHIPPING

IN the House of Lords recently Earl Curzon said that the Government is now administering the entire British mercantile marine, amounting to half the gross tonnage of the world. Forty-three per cent. of British tonnage has been requisitioned for naval and military purposes; 14 per cent. is carrying foodstuffs and raw material on behalf of the Government and its Allies, and the remaining 43 per cent. is being operated by British owners under State regulations.

U. S. TRADE WITH AUSTRALIA

PHILLIP B. KENNEDY, director of the Department of Trade and Transportation at New York University School of Commerce, has been appointed Commercial Attache from the United States to Melbourne. The main object of Mr. Kennedy's work will be to foster a friendly spirit between the United States and Australia, and to help as much as possible to keep the commercial relations on a sound footing. Speaking to a press representative, Mr. Kennedy expressed the view that the United States was exceedingly friendly to Australia. America had watched Australia's part in the war with the greatest admiration, and had taken much interest in her national schemes, particularly in the training of cadets, which he believed would be copied in the United States.

The Eastern Car Co.

New Glasgow N.S.

STAFF ARTICLE

The directors of Nova Scotia Steel & Coal Co. some three or four years ago noted that Canada's demand for railroad rolling stock was increasing faster than its car-building capacity. Further, as keen business men they saw, in addition, that a car construction plant in close alliance with "Scotia" could not fail to provide a good customer for their various steel products. As a consequence, they decided to promote and establish the Eastern Car Co., the plant and equipment of which at New Glasgow, N.S., together with the variety product turned out, form the subject matter of the accompanying article.

THE enormous amount of railway construction which has taken place in Canada in recent years, and is still progressing, although curtailed to some extent on account of the war, not only as to the main trunk lines of the three trans-continentals, but also as to their double trackings and the intricate network of branch lines, which is gradually altering the agricultural and industrial features of the entire Dominion, necessitates a very large amount of rolling stock material. The opening up of new territory and the consequent increase of trade and population, each contribute to a brisk demand for rolling stock.

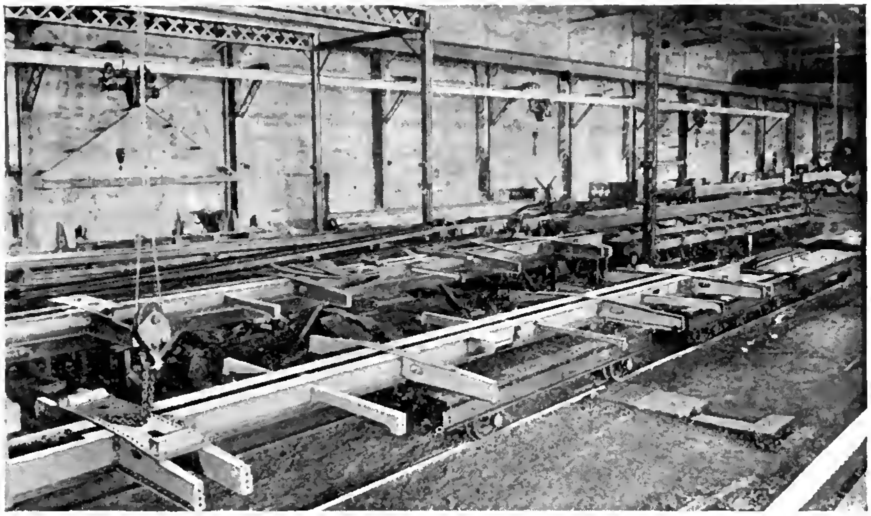
The Eastern Car Co. began operations in September, 1913, and since that time has developed a system of manufacturing capable of producing 40 cars daily. The market for these cars—at home and abroad—is easily capable of absorbing the entire output. Freight cars of all types in wood and steel are being produced.

The company is a subsidiary of the Nova Scotia Steel & Coal Co., the properties of the two concerns being adjacent to each other on the banks of the East River at New Glasgow, N.S. The recent improvements on this river enable ocean-going vessels to land direct at the company's wharf, giving them excellent shipping facilities by both rail and water. The plant was designed and constructed by Horace H. Lane, consulting engineer, Detroit, Mich., who had an organization on the work until the whole was in complete operation. The site embraces some 65 acres.

GENERAL OFFICES, EASTERN CAR CO., NEW GLASGOW, N.S.

Material Handling Efficiency

There are few engineering institutions in which so great a variety of heavy material is handled in such large quantities as in a freight car plant; therefore, to be efficient, everything must



FREIGHT CAR BODY ASSEMBLY DEPARTMENT.

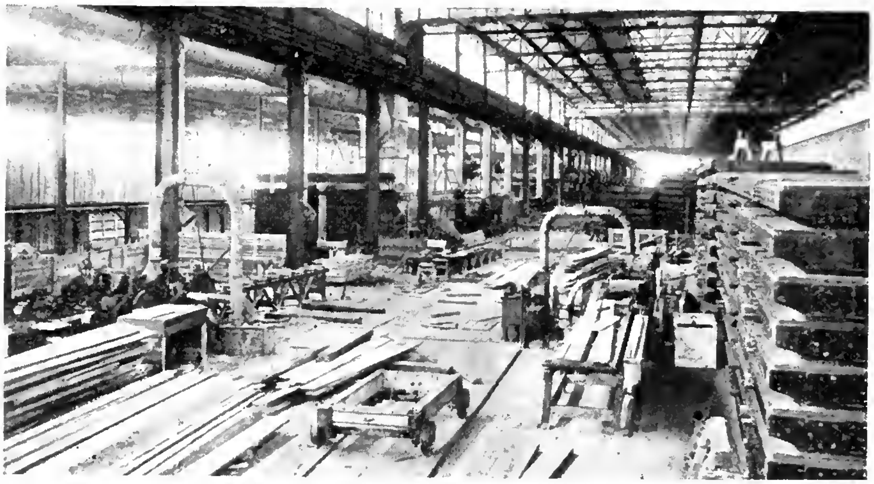
be so arranged that the various materials travel forward steadily from the time they enter the plant until they emerge in the finished product. In some plants the various parts of a car are made in separate buildings, and taken from there to the erection shop, where they are assembled. Some parts, however, go to two or three different buildings before reaching the final assembly.

In this plant it has been aimed to eliminate as far as possible the unnecessary transportation of material and the different departments are for this reason largely centered under one roof, this having the additional advantage that work is not so much affected by weather conditions as it would be with the departments in a number of separate buildings.

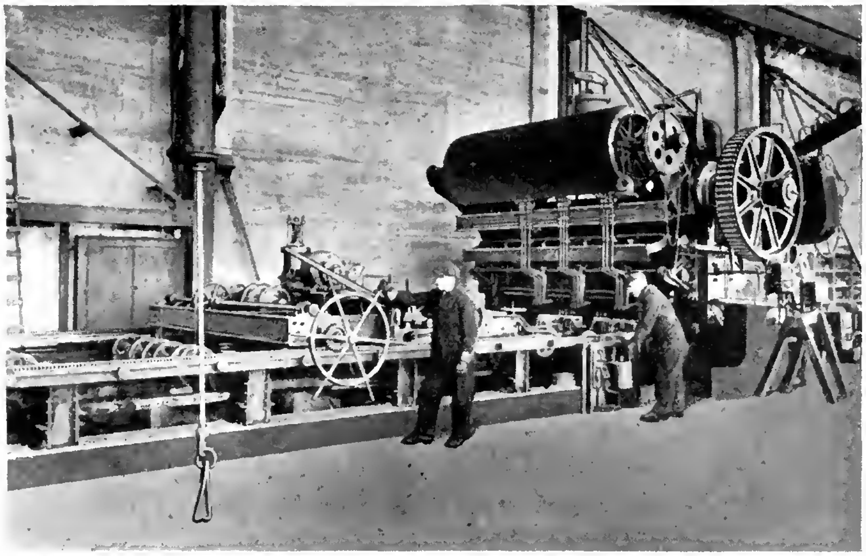
The shops in which the cars are built are the last word in industrial construction as to light, air, warmth and, as already stated, convenience of arrangement. They consist of four parallel buildings, each 1,100 ft. long and 90 ft. wide, all of steel, with concrete foundations and reinforced concrete walls. The storage yard for steel, lumber and other material is at the west end of the plant, the material travelling towards the other end, from whence it emerges as a finished car any type.

The first span contains the air brake, forge, bolt and rivet machine and truck departments, and the general stores, the arrangement being such that the wheels, axles, forgings and other materials for trucks move comparatively short distances until they are assembled, the finished trucks coming out at a point very close to where they are used on the erecting tracks in the next span.

The second span is devoted entirely to the steel department, and contains the shearing, punching, pressing and riveting departments, arranged practically in the order named. The material when brought into the shop is first sheared, then punched and pressed, after which the various units and small parts are assembled and riveted as far as possible before going to the erecting tracks where they are assembled in the completed car. Here again the "progressive" plan is used. The trucks are placed on the erecting track and the main members of the underframe are placed upon it and bolted together. The car then moves to the next "station," where another gang of men proceed with the riveting and further assembling, and so it proceeds from one station to another until by the time it reaches the end of the shop, the steel work is completed. If the car is not an all-steel car, it is then transferred to the next span where the wooden superstructure is completed. The railroad tracks on which the cars are built are located here, and in connection with each track there is an overhead runway, on each of which are located twelve 5-ton hoists, or two hoists for each successive position reached by every car as it approaches completion.



PLANING MILL WITH CAR UNDER-BODIES IN FOREGROUND.



WILLIAMS-WHITE AUTOMATIC PUNCHING MACHINE.

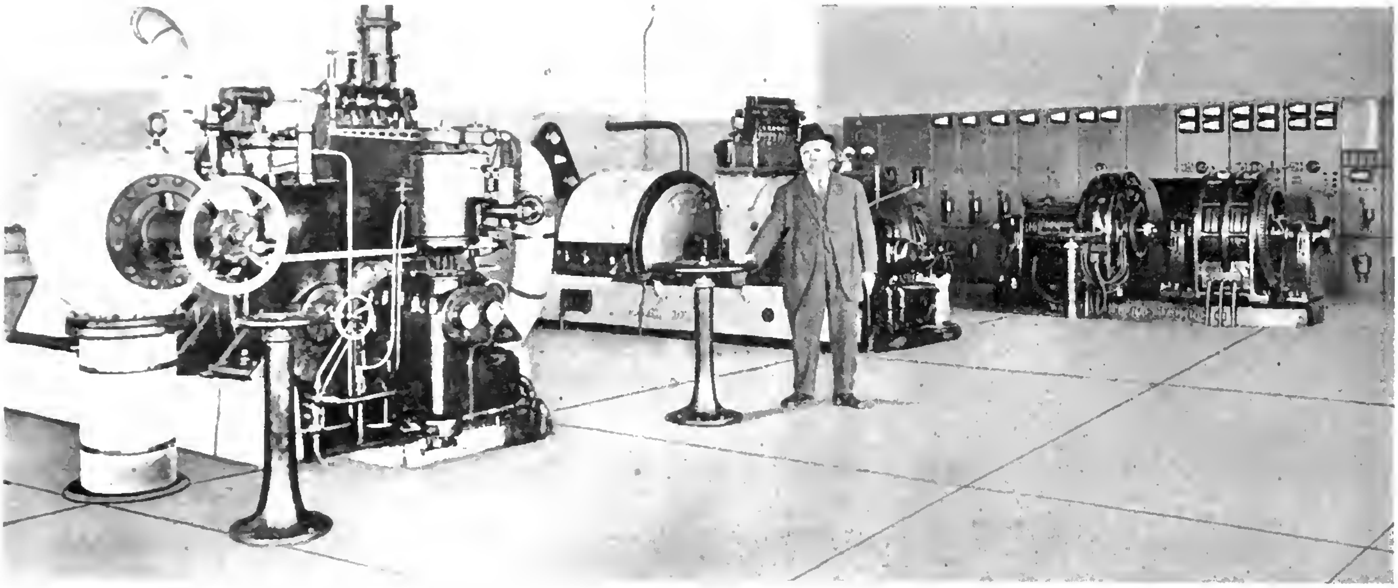
The third and fourth span are taken up with wood-working machinery and wood car erection; the foremen's offices, tin shop, pattern shop, electrical and other maintenance departments are located in the fourth span. The floors of each of the three last-mentioned buildings are controlled throughout the whole length by two 10-ton cranes. There are two in the wood car shop, three in the

steel car shop, and two in the truck and forge shop. The central power house provides current for the electrically-driven machines throughout the plant, also power for the hydraulic presses at a pressure of 1,500 lbs., and compressed air of 200 lbs. per square inch.

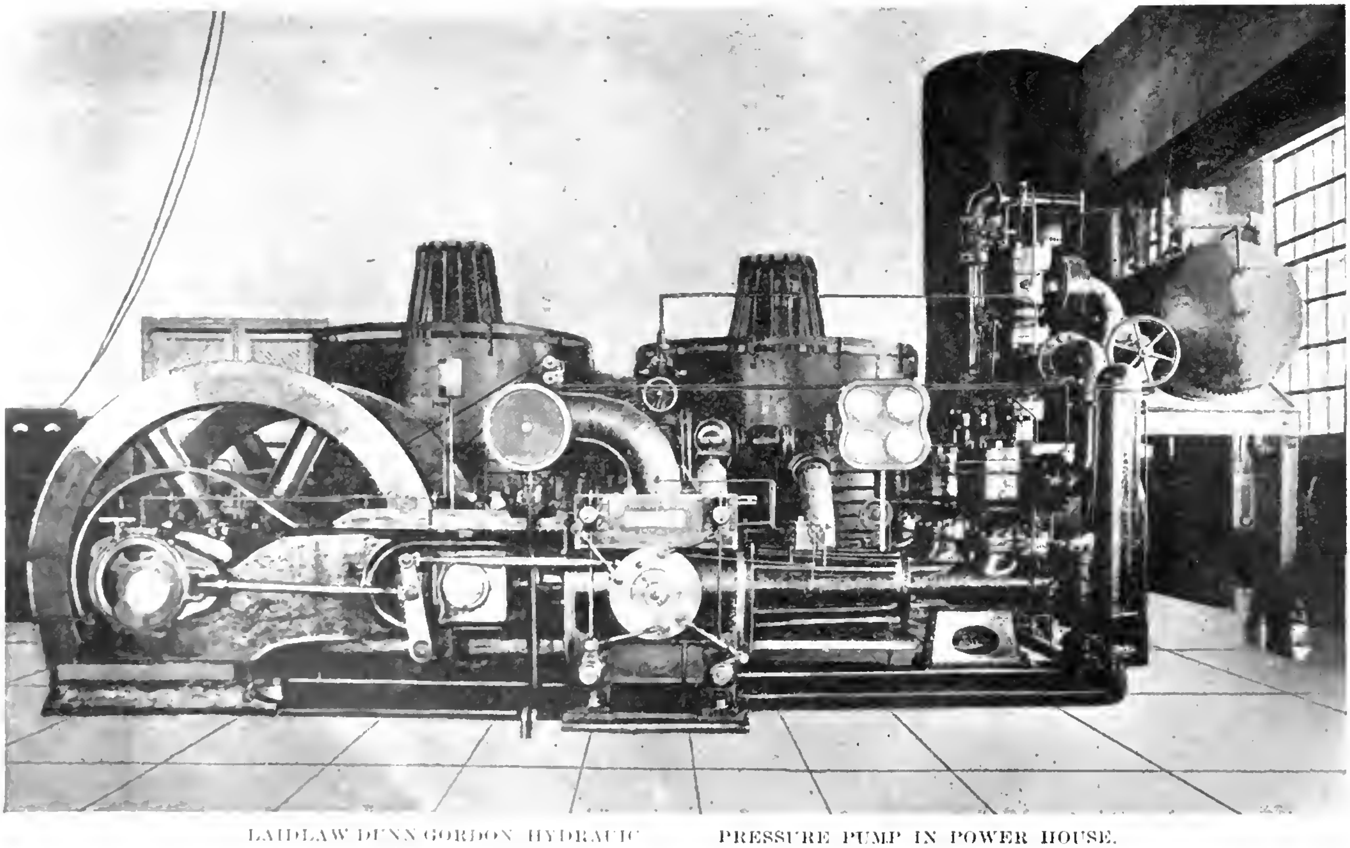
General Equipment

The entire equipment has been selected with a view to building any type of wood or steel car, special attention being given to the heavy steel underframe type which is being so universally used, the heaviest class of automatic machinery being installed for this work. For example, four large Thomas automatic spacing tables and Williams White punching machines are provided. These will punch sheets up to 10 feet wide and 50 feet in length, automatically without any template or pattern, producing the work with greater accuracy and rapidity than can possibly be done by hand. Two R. D. Wood hydraulic presses are installed of 300 and 500 tons capacity, provision being made for a third to be installed later. Most of the machine tools were furnished by John Bertram, Sons & Co., Dundas, Ont., and Canada Machinery Corporation, Galt, Ont.

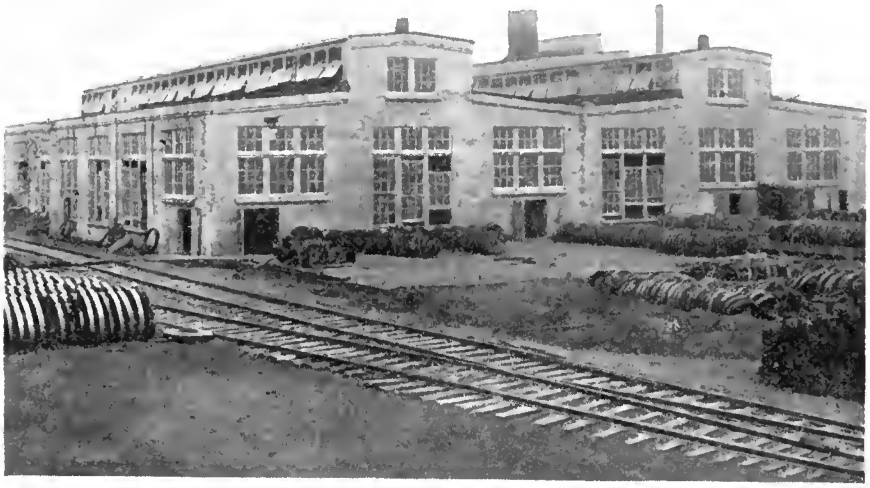
All machines so far as possible are individual motor driven, electricity being used wherever convenient. Very few air hoists are employed, nearly all of the work being done by electric hoists. In order to handle material between the different shops, two outside crane-runways, for operating across the end of the four



INTERIOR OF POWER HOUSE, SHOWING TWO 750 K.W. TURBO-GENERATOR SETS, THE 200 K.W. MOTOR GENERATOR SET, AND MAIN SWITCHBOARD.



LAIDLAW-DUNN-GORDON HYDRAULIC PRESSURE PUMP IN POWER HOUSE.



EXTERIOR VIEW OF CAR WHEEL AND GREY IRON FOUNDRY DEPARTMENTS.

buildings, have been provided and equipped with 10-ton Shaw electric cranes.

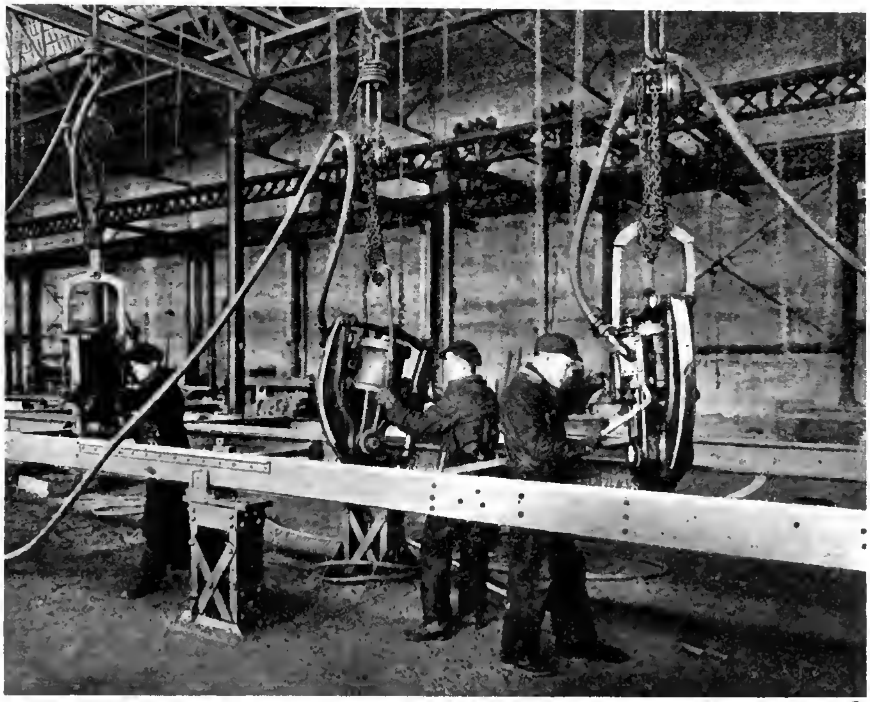
The paint shop to the north of the main four-span buildings is 1,100 ft. long by 150 ft. wide. It is not only used by the paint department, but also as a storage for cars, having accommodation for about 250 of the latter. In addition to the travelling cranes, each of the buildings has a system of narrow-gauge tracks, with turn-tables at intersections, thus giving a very flexible transportation service. Among the other accessory buildings which go to make up the plant are the following: Power house, dry kiln, lumber storage, general storeroom, paint and oil storage, locomotive house, general office, etc.

The Power House

The power plant, housed in a separate structure, is close to the west side of the main building, midway along its length, as central as possible without being too far from the supply of condensing water. The condensing water is taken from the East River, 1,000 ft. away. A pump house is built on the shore of this river, containing three electrically-driven pumps with remote control, so that the operator can start and stop them from the power house without the necessity of going to the pump house except for occasional inspection. Water for the boilers and for drinking, etc., is supplied free by the town of New Glasgow.

The power house building is 113 ft. by 120 ft., and is divided into separate engine and boiler rooms, with direct access to each. Three Edge-Moor type water-tube boilers of 600 horse-power each are installed; provision is also made for two more. All are equipped with Foster superheaters and Green chain grate stokers, and the installation is guaranteed for a continuous overload of 50 per cent. Overhead steel bunkers lined with concrete are provided for coal storage and a continuous conveyor handles the coal from the track hopper to the bins. Automatic ash conveyers are also installed. Provision has been made at each boiler for burning wood refuse and shavings, the material being handled by a blower system which delivers it direct to the boilers. Any boiler can in a few minutes be changed from coal to wood or vice versa, an arrangement which, it is found, gives better results than burning wood and coal together. The working pressure is 200 lbs. with 100 degs. superheat. The chimney which is of concrete rises 175 feet above the grates.

INTERIOR OF CAR WHEEL FOUNDRY SHOWING FLASKS.



PNEUMATIC RIVETERS AT WORK ON STEEL CAR FRAMES.

Engine Room

Both direct and alternating-current electric power is used. The alternating current is 3-phase at 600 volts and the

direct current, which is used on cranes and variable speed motors, is at 220 volts. The electric power plant consists of two 750-kw. turbines furnished by the Canadian General Electric Co. and there is provision for a third unit of the same size. One of the two turbines installed is equipped with a bleeder attachment which allows steam to be extracted between stages for heating or dry kiln purposes, the remainder of the exhaust going through the condenser. The other turbine is of the mixed pressure type, and can be run with either high or low pressure steam, or both. A motor-generator exciter set of 35 kw., and a turbine-driven exciter set of 25-kw. are also installed. During the summer months this machine can utilize the exhaust steam from the air compressors, hydraulic pumps and auxiliary machinery, making altogether a very flexible and highly economical combination arrangement.

BORING CAR WHEEL HUBS.

Auxiliary Lighting

A Terry turbo-generator of 125-kw. capacity has been installed to take care of overtime loads, such as night and Sunday lighting, etc. A 200-kw. motor generator set provides the direct current, with both steam driven and electric driven exciters. The switchboard and bus-bar arrangement has been designed particularly to make the plant highly flexible. The main circuits leave the power house in conduits and the whole system of electric connections in the power house is arranged with ample space to afford ready accessibility. The turbines are provided with synchronizing motors and are also controlled by a Tirrill regulator.

One cross-compound, two stage Canadian Ingersoll Rand, Corliss type air compressor of 3,000 cub. ft. capacity has been installed and provision made for a second unit of the same size. A hydraulic system has also been provided, one 3-cylinder compound, fly-wheel high pressure pump being now in service, while the second will be installed when opportunity offers. Two large accumulators are located in the power house to take care of load fluctuations.

Heating and Pumping

The main building is heated by four large fans and heaters provided by the Canadian Sirocco Co., these units each containing tiers of indirect radiation heated by exhaust steam from the power house. A Sirocco fan on each unit distributes the heated air through ducts to the various parts of the shop.

Beginning at the power house and extending across the entire width of the main building, a tunnel 6 ft. 6 in. by 7 ft., is provided with smaller branches leading to the various departments. In this tunnel are placed all main electric cables, steam, exhaust, air, and hydraulic piping, making it all readily accessible for inspection and maintenance.

Other power plant equipment consists of two Weir boiler feed pumps; Blake-Knowles feed water heater, Martin pump for taking care of heating system returns, Laidlaw-Dunn-Gordon hydraulic pressure pumps, two H. R. Worthington condensers of 1,600 and 3,100 sq. ft. of surface respectively, Blake-Knowles air pump, and Terry turbine driven centrifugal pump.

Foundry Department

The foundry department consists of two buildings, one housing the wheel foundry and the other the steel and gray iron foundry, with floor areas of 60,000 and 30,000 square feet respectively.

The wheel foundry is of the straight floor type, and is provided with pneumatic and electric equipment for handling all ladles, flasks and finished wheels. It is arranged for an ultimate capacity of four hundred wheels per day. Wheels can be rolled direct to the truck shop, a distance of 60 feet.

Export Trade

Three more hydraulic presses have recently been installed, the plant being now thoroughly equipped for the manufacture of "All-Steel" cars, in addition to all varieties of freight cars, cabooses and mine cars. At the present time it is engaged in filling an order for "All-Steel" coal cars of 100,000 lbs. capacity for the Canadian Government Railways, has just completed two thousand 75-ton cars for the Russian Imperial Government, and is working on 3,000 Standard cars for the French Government.

During the past two years the management has devoted a great deal of attention to the foreign market, and the

HYDRAULIC WHEEL PRESS FOR PRESSING ON WHEELS TO AXLES.

successful manner in which it has handled the large European orders already secured is a good indication of the position the company is in to take care of future orders from abroad.

In addition to the very large and complete equipment described and illustrated in these pages, the Nova Scotia Steel & Coal Co. fleet of ocean steamers for freight carrying purposes, is at the disposal of the Eastern Car Co. for taking care of their shipments of cars, car parts and equipment to European and other foreign markets.

The company has developed a system of manufacturing capable of producing forty cars daily. All types of freight cars, of wood or steel, are being constructed both for the Canadian and for the foreign market. The first order received when the plant started in 1913 was for 2,000 standard box cars for the Grand Trunk Railway System.

Russian and French Cars

During the early part of 1915 the Russian Government Railways and the French Government were in the market for a large number of cars. After demonstrating the ability of the Eastern Car Co. to deliver cars by their own steamers to any ports, the first order was secured from the Russian Government for 2,000 forty-ton steel frame box cars.

This type of Russian car is exceptionally large, and in a number of ways resembles the Canadian Pacific type of box cars. It is unusually long—43 feet, and has a carrying capacity of 40 tons of grain. The gauge of track for these cars is 5 feet, which is 3½ inches wider than the standard gauge of Canadian roads. The wheels are of cast iron—41⅜ inches in diameter. The roof is made of a design generally used in Russia, consisting of sheet steel on pine boards. There are no holes whatever through the sheets or the lap of the roof, therefore no danger of leakage. The running boards are protected by a railing, thus safeguarding the trainmen, who are not in the habit of walking along the roof of the small two-axle cars common in Russia. In these and other respects the Russian cars are designed specially to meet the requirements of the Russian State Railways.

When the French Government came in the market for a special type of freight cars, they placed with the Eastern Car Co. an order for 1,000 twenty-ton cars, and followed this later with an order for 2,000 more of the same type.

Both the Russian and the French Governments are, we understand, negotiating for further orders for freight cars, and from what we have seen the company is in an exceptionally good position to take care of these and other foreign car orders, in the order in which they are received.

LOADING FREIGHT CARS "KNOCK-DOWN" AT PICTOU LANDING FOR SHIPMENT TO RUSSIA.

Lumbering Department

The company controls, in its Newfoundland and Nova Scotia timber areas, 107 square miles of timber land, consisting of spruce, fir, hemlock, birch, beech and maple, from which the average yearly output of lumber is from five million to six million feet board measure. In Nova Scotia most of the lumber is sawn by portable mills which are taken into the district being lumbered, and the sawn lumber is hauled to the nearest railway siding. In Newfoundland, the logs are stream driven down the Gander River, and the sawmill is situated on an arm of Gander Bay, where steamers load for the Ore Mines at Wabana. Practically all of this lumber is used for the company's requirements, and at Wabana Mines, Newfoundland; Sydney Mines, C. B., and New Glasgow, N.S.

All the buildings except the main office are steel and concrete throughout. They are of a specially substantial type, and practically all material is stored under cover, there being no interruptions due to inclement weather. The principal lighting is done by flaming arc lamps, but in the power house and smaller buildings, large tungsten lamps are used. The main office which is located at the entrance to the plant is built of brick with stone and cement trimmings.

IMPORTANT TRADE COMMITTEES APPOINTED

THE President of the British Board of Trade has appointed two further committees to consider the position of certain branches of British trade after the war, with special reference to international competition, and to report what steps, if any, are necessary or desirable in order to safeguard that position. These committees are as follows:

Textile Industries

Henry Birchenough, C.M.G. (chairman), Sir F. Forbes Adam, C.I.E., James Beattie, T. Craig Brown, E. S. Fielder, J. W. Hill, Albert Illingworth, M.P., J. H. Kaye, E. H. Langdon, J. W. McConnol, H. Norman Roe, Sir Frederick Smith, Bart., T. C. Taylor, M.P., The Right Hon. Robert Thompson, M.P., Frank Warner.

T. Ainscough will act as secretary to the committee, and all communications relating to it should be addressed to him at 6 Whitehall Gardens, S.W.

Electrical Trades

The Hon. Sir Charles Parsons, K.C.S., F.R.S. (chairman), J. Annan Bryce, M.P., T. O. Callender, James Devonshire, B. M. Drake, Sir John Snell.

All communications should be addressed to the secretary, Electrical Trades Committee, at 7 Whitehall Gardens, S.W.

The president of the Board of Trade has further appointed Sir Joseph P. Maclay, Bart, and Summers Hunter, to be additional members of the Shipping and Shipbuilding Committee, and F. H. Marker, of the Board of Trade, to be secretary to that committee.

Steel Mill for Montevideo.—Uruguay is to have a mill to roll steel billets into merchant bars and small shapes. It is to be situated at Montevideo, and contracts are said to have been placed in Pittsburgh for an 18 in. train of rolls and other equipment. The project has been developed by A. Voulminot, formerly a representative of the American Bridge Co. in South America. The Government of Uruguay is to furnish half of the financial backing.

Russia's Machinery Market from a Competitive Viewpon*

By P. Gurewitch

As a potential purchaser, Russia possesses a peculiar fascination for producers in the leading industrial countries. That at some time in the future her large natural resources will alter the economic situation of the country, there is no doubt, but the probability of the nation's needs developing more rapidly than its production precludes the possibility of internal competition assuming monopolistic dimensions for several decades yet.

THE beginning of the machinery trade in Russia dates back to the early sixties following the emancipation of the peasants from serfdom in 1861, this far-reaching event giving the first impulse to Russia's conversion from a purely agricultural to a mixed agricultural and industrial state.

Early Stages

For many years thereafter the state was the most important customer, large quantities of railway materials, locomotives, etc., being required for the railways which were built by the state, whilst considerable orders were given for the army and navy. In view of the fact that early manufacturing enterprises were founded to supply the requirements of and were maintained by government work, the general market remained stagnant, and development was retarded by the absence of rivalry and competition such as existed in Western Europe. The result of this one-sided development was that in later years when an industrial crisis arose, due, among other causes to a lessening of railway orders, the country was dependent on foreign supplies for more than 40 per cent. of all machinery and apparatus not specially connected with railroad requirements.

Recent Growth

The extent and rate of development attained by Russia's machinery requirements can be gathered from the following table in which it should be noted that although its percentage of the total imports decreased slightly in 1913, the actual amount of machinery imports was increasing at a greater rate each year.

Years.	Machinery Imports to Russia. *Roubles.	Total imports of all goods to Russia. Roubles.	Machinery Imports in % of total imports. %
1911 ..	147,000,000	1,022,700,000	11.4
1912 ..	149,200,000	1,031,600,000	14.4
1913 ..	163,700,000	1,220,500,000	13.4

*Roughly 10 roubles (actually 9.46) go to the pound sterling. Thus the value in English money is given roughly by cutting off the last "0."

With regard to Russian home production of machinery, according to the statistics of the Russian Ministry of Finance in 1900, the whole of the state and private manufacturers produced various machines to the value of 52,000,000 roubles, on the making of which 49,000 workmen were engaged.

In the year 1908 the number of workmen increased to 110,000, and the values of machinery produced to 140,000,000 roubles. Thus the value of machines manufactured in Russia increased in eight years by 173 per cent., and the number of workmen by 124.5 per cent.

Value of Production

The value of machines produced in Russia in 1912 is calculated by expert authorities to be 210,000,000, which when added to that year's machinery imports gives a value to the year's demand of 360 million roubles (=say $180,000,000).

According to official statistics from the various authorities, this volume of machinery imports was divided amongst the four leading export nations as follows:—

	Exports of machinery to to Russia.	Total of machinery exports.	Exports to Russia in % of total exports. %
England	£3,885,664 = 36,758,000 R.	=£34,743,000	11.2
Germany	M.129,918,000 = 59,762,000 R.	M.678,000,000 =£33,450,000	19.2
Switzerland	11,741,000f. = 4,402,000 R.	76,776,000f. =£ 3,046,000	15.3
U.S.A.	....	$127,981,000 =£26,350,000	....
Total of machinery exports, £97,599,000.			

The figures show that Great Britain's share in the Russian market for machinery was the smallest, while nearly one-fifth of the total German and one-sixth of the total Swiss machinery exports went to Russia, only 11.2 per cent. of the whole of Great Britain's machinery trade was done with Russia. As the importer of 19.2 per cent. Russia was the chief importer of German machinery, as Germany exported to Austria in 1913 only 11 per cent. of its total machinery export, 10 per cent. to France, 7 per cent. to England, and 5 per cent. to Belgium, Holland, and Italy respectively. In five years the Germany machinery export to Russia increased more than $2\frac{1}{2}$ times, or 250 per cent., so that in 1913 it was $12,000,000, or 64 per cent. higher than the British export to the same country.

Skilled Labor Scarce

A scarcity of good engineers is felt everywhere, on account of there being insufficient middle and high grade technical schools. Only a few hundreds of young men can be taken yearly at each of the technical universities of Russia, while the number seeking admission to further their studies amounts to thousands. Hence the most severe entrance examinations have to be passed in order to lessen the number of the candidates. To this must be added, that special limitations are framed against Russian subjects who do not belong to the orthodox church, especially Jews, disqualifying them for entrance to the universities. The result was that thousands of young men used to go to Germany before the war to study at the technical schools. These young people, after having learnt the German language and gained a knowledge of Germany machinery and materials, after they returned to Russia and became managers of factories naturally gave German products the preference.

The lack of capital and long credit greatly checked the development of the Russian machinery industry. The establishment of companies was made difficult by the founders having to apply to the Russian Government for concessions, the statutes having to be laid before the Cabinet by the Minister of the Board of Trade for the purpose of ratification. The minimum capital required for founding a company as well as the value of shares, are, according to present Russian company law, much higher than in other countries. In the last years before the war the reactionary party limited, by its oppressive policy, the rights of the unorthodox citizens as regarded the founding of companies, thereby checking the progress of company promotion. The suspension of this harmful mediaeval religious persecution has been agitated for by most Russian industrial organizations and far-seeing politicians, but, to the great prejudice of the whole of Russia, in vain.

These are only a few of the chief reasons stigmatized by the most important Russian economists, far-seeing politicians, the corporations, trade societies and congresses, as the cause of Russia's weak development in industry.

*An abstract from a series of articles in The Engineer, dealing with British Machinery and the Russian Market.

This question has been gone into at length, in order to show that the hindrances to Russia's industrial development are of a passing character only, and that hand-in-hand with political progress and reform these evils will disappear. The war has brought out vividly the crying need for reforms, and it is to be hoped that they will soon be introduced. Then the Russian industry will develop by leaps and bounds, as there is an enormous inland market and no scarcity of raw materials.

Future Conditions and Influences

Then the Russian market will become of great importance to the English machinery industry, as the Russian industries being freed from the checking influences above mentioned will require enormous quantities of new machines of all kinds. The Russian machinery industry will be fully engaged in order to cope with the increased demands in simple machines for many years to come. Complicated and special machines will have to be imported for a long period from those countries which have a long experience in machine construction and do not work solely for a limited inland market, but for the world's markets. A machine manufacturer can only alter and perfect his models and produce a series of cheaper machines if he has an enormous output.

Having now dealt shortly with the future of the Russian machine industry, the present conditions will be reviewed.

Present Costs Handicap

The greatest obstacle checking the Russian machinery industry consists, however, in the enormous cost of raw materials, semi-finished products and fuel. This burden of costs has been a real calamity for the whole Russian industry for many years. The reasons of these unnatural high prices, which are unknown in other countries, will be discussed later.

In consequences of the extraordinarily high costs of production, the cost price per ton of even simple machines, according to the information of the Society of Manufacturers for the Moscow District, is in Russia £28.8 sterling dearer than in Germany. One-half of these increased productive costs is to be ascribed to the high prices of raw materials and fuel. The difference between the manufacturing costs of complicated machines is still larger.

The above explanations give the reason why even simple agricultural machines and implements are imported into Russia in such great quantities year by year.

Agricultural Machines

Russia being for the most part an agricultural country, its requirements for agricultural machinery are very large, but the Russian factories are not able to supply the country's requirements. However, it may be here mentioned that of all the branches of the Russian machinery industry the manufacture of agricultural machines is the most developed.

The inland production of machinery of this kind in Russia reached in 1911 a value of 48,000,000 roubles, in 1912 it increased to about 52,500,000 roubles, and shortly before the war it amounted to between 60 and 70 million roubles. The demand was, however, so large that agricultural machinery in 1911 to the value of 54,400,000, in 1912 of 58,700,000, and in 1913 of 63,500,000 roubles had to be imported from abroad. The total yearly requirements of the Russian market for agricultural machines were in 1913 about 125 million roubles (=$62,500,000).

The future prospects for this trade with Russia are excellent. Agricultural machinery to the value of $17,500,000 has not been able to enter Russia in consequence of the interruption of the last year's imports by the war. The Russian inland production of these machines has also greatly decreased. Apart from the stoppage in production of agricultural machinery in fifty-seven factories of Russian Poland, most other factories of inner Russia have had either to stop work altogether, or greatly to diminish their output, on account of lack of raw materials and fuel. In consequence of this one may assume that the importing of agricultural machines to Russia in the future will be even more considerable than in normal years before the war.

Prime Movers

While no specific figures can be given regarding English exports of prime movers to Russia, it is interesting to know that for internal combustion engines alone, the demand increased from $9,000,000 in 1910 to $13,000,000 in 1912, only one-half of the demand being met by the home makers. According to Professor Sawwin, the Russian industry in the last-mentioned year required steam engines, steam turbines, and portable engines to the value of $5,000,000, one-third only of the steam engine demand being met by inland production. The total value of Russia's requirements in prime movers increased from $16,750,000 in 1910 to $22,500,000 in 1912 in which year the total home production amounted to $7,250,000.

The German proportion of this business was very great, being 76 per cent., according to Russian statistics, but really amounting to less because of certain methods of classification. These exports, however, included 1,776 internal combustion engines, 808 portable engines, 264 steam engines, 77 water-power machines, and 57 steam turbines, amounting to 24 per cent. of Germany's total export of this class of goods.

Metal-Working Machines

In four years the total imports of these goods increased nearly three-fold amounting in 1913 to $6,350,000. The inland manufacture of metal-working machines in Russia is of all branches the least developed, very few factories producing such machines. In some quarters there is considerable agitation for a re-adjustment of the tariff, but the real causes of the weak development of Russia's production of metal-working machines are to be found in quite other direction which have already been dwelt upon. It is interesting to know that of the total British foreign trade in sewing machines in 1913, 35.5 per cent. value over $4,000,000 was sent to Russia, being nearly double that of Germany, and 3½ times that of the United States.

Mining Machinery

The chief provider of mining machinery was Germany, all large German manufacturing companies having their representatives in South Russian coal and iron districts, where however, the mines are chiefly in the hands of French and Belgian companies, who whenever possible, gave preference to machines of their own nationality. Owing to difficulties in the way of classification no statistics are available for comparison between different countries, but future prospects for this trade with Russia are excellent. After the war Russia's coal and ore production will be considerably increased, as all easily available supplies were used up long ago. Moreover, the imports from abroad, which were very considerable during the last few years, will hardly reach their former proportions in the period immediately following the conclusion of peace. Consequently Russia will be forced to pay increased attention to its own coal and ore production.

Conclusions

Coke, naphtha, iron, and copper production are all important industries which in course of time will assume their places of importance in the economic structure of the country, but not being finished products do not occupy the attention of manufacturers to the same extent as machinery, etc. Amongst the latter might be mentioned flour mill machinery, clay, lime and cement machinery, and machines for the wood and timber industry.

The question of Russia's present and future tariff policy is of vital interest to and affects the British machinery industry in no small degree. British machinery exports to Russia before the war amounted to 11 per cent. of Britain's total machinery exports, and it greatly depends on Russia's future tariff policy whether these important exports worth about twenty million dollars are promoted or checked.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. MAY 25, 1916 No. 21

THE ENTERPRISE OF "SCOTIA"

IN this issue considerable space has been given to a description of the various plants of the Nova Scotia Steel & Coal Co., as also to its subsidiary, the Eastern Car Co. Doubtless what will most strike readers of the different articles is the practically self-contained nature of the main and parent enterprise. Resources, location and ultra-created facilities as regards raw material entering into almost every class and type of wood and metal product, and the ease with which these can be made available or brought, so to speak, to the door of the consumer, lead one to the not unreasonable conclusion that such a concern could not do otherwise than make good, irrespective of occupying a foremost place in the industrial life of the country to which it belongs.

It will be abundantly evident, however, that something more than resources, location, and ultra-created facilities have brought this big Canadian corporation to its to-day-place of prominence in a world sense. The grim determination of the human element has permeated the career of the organization for a generation or more, and with it has been coupled an intensive and well-directed energy, safeguarded at every turning by native caution and the vision to anticipate and take advantage of opportunity. In view of the foregoing, small wonder is it then, that, the announcement of establishing a shipbuilding plant in connection with its other activities at New Glasgow and elsewhere has aroused not only the keenest interest in business and commercial circles, but has earned as well the enthusiastic commendation of Canada's citizens generally, and that of the shipping and shipbuilding fraternity particularly.

New life as it were, has been given to the shipbuilding industry throughout the Dominion, and in saying so we refer to the construction of steel steamships. In recent years many and varied attempts have been made to enthuse our Governments at Ottawa on the subject of support for Canada's shipbuilding enterprises, but somehow, and very probably on account of the lack of backing by our big steel corporations and others, a more or less deaf ear was turned to the requests and pleadings. Irrespective, however, of past experiences, and because of a new set of circumstances prevailing as a result of the war, there has developed a new attitude to the shipbuilding industry by our commercial and industrial interests, large and small. In consequence, we find the Nova Scotia Steel & Coal Co. now engaged in the preliminaries attendant on the creation of a steel shipbuilding plant with a view to construction of their first vessel.

Nova Scotia in years gone by occupied a place of no mean order in the shipbuilding of the world, but had to forego the distinction when steel vessels began to supplant those of wood for long or short deep sea services. Most sanguine expectations as to the outcome of "Scotia's" new venture find ready expression, and if one might judge by the results achieved by "Scotia" in its other spheres, there is little doubt but that the success predicted will be fully realized. It may be, in addition, that the province of Nova Scotia will again attain to its former high place in world shipbuilding, thereby reviving its former glory and adding lustre to it because of a dual significance.

WINTER NAVIGATION ON THE ST. LAWRENCE

IN connection with the launch of the ice-breaker, J. D. Hazen, from the plant of Canadian Vickers at Montreal recently, the possibilities of prolonging the winter service on the St. Lawrence River have been widely discussed. The opinion has been expressed that there was not a day during the whole of last winter when an ocean steamer could not have entered or departed from the port of Quebec, assisted perhaps during the most severe weather by such an ice-breaker as the J. D. Hazen.

The possibilities of the development of Canada's great inland ocean ports through a winter service on the St. Lawrence have long been considered in relation to Montreal and Quebec. Montreal as an all-year-round port would logically be the greatest shipping point on the continent. Situated at the heart of North America, it would be the great economic distributing point of both Canada and the United States. Such development of the port as has been effected has been in the face of the handicap of maintaining the overhead expense of facilities which can only be made use of during a portion of the year. The difficulties of the St. Lawrence route are many; there are delays from fog, slow navigation of the river channel, and loss of time, to weigh against the shorter mileage as compared with American ports—these in addition to the winter freeze-up. However, if, with the aid of ice-breakers, the route could be kept open to Quebec during the winter, it would benefit Canadian commerce and undoubtedly bring a measure of shipping revival to the Ancient City.

SHIP PLATES AND SHAPES PRODUCTION

A POINT worth noting in connection with the proposed subsidizing of shipbuilding in Canada is our ability to have the industry self-contained in so far as the principal materials—raw and finished—are concerned. Among the more important of the latter may be mentioned the ship's hull, tank, bulkhead and deck plating; frames, deck beams, etc. Plates for our ship, tank, and boiler construction are for the most part imported from the United States, and naturally, with a stimulation of either or both industries, imports of these commodities would correspondingly increase. The establishment of a plate mill in Canada capable of dealing with the requirements of at least medium-sized vessels would, therefore, seem to be in order, and is doubtless receiving attention in the proper quarters.

It has, however, always been our understanding that a whole plate mill equipment, although not installed, and capable of rolling steel plates up to 1¼ inches thick by 10 ft. wide, is available at one of our leading steel plants, and, doubtless, if the subsidizing of shipbuilding on our lake and ocean shores is determined upon and put into effect, the above-mentioned mill will be pressed into service.

INDUSTRIAL NOTABILITIES

DONALD HUGH McDOUGALL, general manager, Dominion Steel Corporation, Sydney, N.S., Director Nova Scotia Construction Co., is a native of Nova Scotia, being born at Cape Breton, September, 1879, son of John and Alexis McDougall. His education was received at the Government Mining School, Glace Bay, N.S., International Correspondence Schools and Dalhousie College Summer Schools (Mining Course), after which he occupied the positions of: Apprentice Mechanic, Assistant

DONALD HUGH McDOUGALL.
General Manager, Dominion Steel Corporation.

Mine and Railway Surveyor, Mine Surveyor, Civil Engineer, Engineer in charge of Construction, Dominion Iron & Steel Co., 1900; Assistant Resident Engineer, New York Central and Hudson River R.R., 1902; Manager, Wabana Mines, Nfld., 1904; Superintendent Mines and Quarries, Dominion Iron & Steel Co., 1907; Assistant General Manager Dominion Coal Co.; Superintendent of Mines and Quarries, Dominion Iron & Steel Co., and Assistant General Manager Sydney & Louisburg R.R., 1910; present position since January, 1916.

Mr. McDougall's new position carries with it the responsibility of directing the energies of 16,000 employees, and controlling the activities of what ranks among the largest single enterprises in Canada.

He is president of the Mining Society of Nova Scotia, a vice-president of the Canadian Mining Institute, a member of the Institution of Mining Engineers (England), and a member of the Canadian Society of Civil Engineers.

Mr. McDougall married Clara E. Gillis, daughter of John Gillis, in 1906, and resides at King's Road, Sydney, N.S., his family consisting of four sons and one daughter.

His clubs are: Royal Cape Breton Yacht; Halifax City; St. John's (Nfld.).

—Photo, Courtesy International Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 70	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	
	Montreal	**Toronto**
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Victoria, No. 1	$27 00	$25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Common bar iron, f.o.b., Toronto	3.00
Steel bars, f.o.b., Toronto	3.00
Steel bars, 2 in. and larger, base	5.25
Common bar iron, f.o.b., Montreal	3.00
Steel bars, f.o.b., Montreal	3.00
Twisted reinforcing bars	3.25
Bessemer rails, heavy, at mill	2.50
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	...
F.O.B., Toronto Warehouse.	**Cents**
Steel bars	3.00
Small shapes	3.50
F.O.B. Chicago Warehouse	**Cents**
Steel bars	3.10
Bars, 2 in. and up	4.00
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper, carload	$33 00	$32 00
Electrolytic copper	32 50	31 75
Castings, copper	31 00	31 50
Tin	49 00	54 00
Spelter	19 50	21 00
Lead	9 25	9 50
Antimony	44 00	41 00
Aluminum	68 00	68 00

Prices per 100 lbs.

BOILER PLATES

	Montreal	Toronto
Plates, 1/4 to 1/2 in.	$4 00	$4 25
Heads	4 25	4 50
Tank plates, 3-16 in.	4 30	4 75

WROUGHT IRON PIPE

Prices in effect April 26, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 06	5 31
1/2 in.	3 91	6 08
3/4 in.	4 72	7 65
1 in.	6 97	11 31
1 1/4 in.	9 43	15 30
1 1/2 in.	11 28	18 29
2 in.	15 17	24 61
2 1/2 in.	23 99	38 90
3 in.	31 37	50 87
3 1/2 in.	37 72	61 18
4 in.	44 69	72 49

Lapweld

2 in.	$17 02	$26 46
2 1/2 in.	25 16	40 07
3 in.	32 90	52 40
3 1/2 in.	39 56	63 02
4 in.	46 87	74 67
4 1/2 in.	57 15	90 81
5 in.	66 60	105 82
6 in.	86 40	137 28
7 in.	116 62	179 70
8 in. x 25 lbs. per ft.	122 50	188 75
8 in. x 25 lbs. per ft.	141 12	217 44
9 in.	169 05	260 48
10 in. x 32 lbs. per ft.	156 80	241 60
10 in. x 40 lbs. per ft.	201 88	311 06

List for Ontario, Quebec and Maritime Provinces

OLD MATERIAL

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 00	$18 25
Copper, crucible	21 50	21 50
Copper, heavy	21 75	22 00
Copper wire	21 75	22 00
No. 1 machine compos'n.	17 00	17 00
No. 1 compos'n turnings	14 75	15 00
New brass clippings	16 25	15 00
No. 1 brass turnings	12 00	12 00
Heavy melting steel	9 00	10 00
Boiler plate	11 75	10 50
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	11 50	10 00
Stove plate	10 50	10 50
No. 1 machin'y cast iron	14 75	14 50
Heavy lead	7 00	7 25
Tea lead	6 00	6 25
Scrap zinc	14 00	14 00
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Coach and lag screws	50
Stove bolts	62 1/2
Plate washers	25
Machine bolts, 3/8 and less	40
Machine bolts, 7-16 and over	30
Blank bolts	30
Bolt ends	30
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in. $3.75 per lb. off	
Nuts, hex., over 1 in. $2.00 per lb. off	
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	37 1/2
Boiler rivets, base 3/4-in. and larger	$4.85
Structural rivets, as above	4.75
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS

	Per Cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	50
Finished Nuts over 1 in.	37 1/2
Semi-Fin. Nuts up to 1 in.	50
Semi-Fin. Nuts over 1 in.	37 1/2
Studs	45
Taper pins	.65
Coupling bolts	net
Planer head bolts, without fillet	.15
Planer head bolts, with fillet	net
Planer head bolt nuts up to 1 in.	.60
Planer head bolt nuts, over 1 in.	.55
Planer bolt washers	list plus 10
Hollow set screws	list plus .20
Collar screws	list plus .20
Thumb screws	.20
Thumb nuts	.75

BILLETS

	Per gross ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES

Standard steel wire nails, base	$3 70	$3 40
Cut nails	3 40	3 40
Miscellaneous wire nails		65%
Pressed spikes, ⅝ diam., 100 lbs.		$3 90

MISCELLANEOUS

Solder, guaranteed	0.31
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	3.00
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.18
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls., gal.	0.69
Linseed oil, raw, single bbls.	0.85
Linseed oil, boiled, single bbls.	0.88
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Packing, square beaded	0.25
Packing, No. 1 Italian	0.30
Packing, No. 2, Italian	0.23
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per Cent.
Standard drills to 1½ in.	45
Standard drills over 1½ in.	5
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	net
Bit stock	55
Ratchet drills	net
Machine bits for wood	15
S.S. drills for wood	45
Wood boring brace drills	25
Electricians	20
Sockets	30
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks	list plus 5
Bridge reamers	55
Centre reamers	net
Chucking reamers	net
Hand reamers	5

High-speed drills up to 1½ in. and over 1½ in. Double list plus 20 per cent.

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60 per cent.; headers, 60; flanged unions, 55; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$4 15	$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 25
Canada Plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	7 00	7 00
Premier, 10¾ oz.	7 25	7 25

PROOF COIL CHAIN

¼ in.	$8.35
5-16 in.	7.35
⅜ in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
⅝ in.	6.35
¾ in.	6.15
⅞ in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B B

⅛ in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16 in.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	60-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	.....
1¼ in.	19 55	.....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	13 00
2¼ in.	26 60	15 45
2½ in.	29 00	17 20
3 in.	38 70	20 00
3½ in.	44 00	24 00
4 in.	49 50	30 60

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	40%
Standard	40 & 10%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun. Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun. Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto

WASTE

WHITE	Cents per lb.
XXX Extra	.16
Peerless	.16
Grand	.15
Superior	.15
X L C R	.14
Atlas	.14
X Empire	.13
Ideal	.13
X press	.12
COLORED	
Lion	.10¼
Standard	.9¼
No. 1	.9¼
Popular	.8¼
Keen	.7¼

WOOL PACKING

Arrow	
Axle	Prices on
Anvil	application
Anchor	

WASHED WIPERS

Select White	
Mixed colored	Prices on
Dark Colored	application

This list subject to trade discount for quantity

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.37 to .39
Tin	.58 to .60
Zinc	.26 to .28

Prices Per Lb.

COPPER SHEETS

	Montreal	Toronto
Bars, ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 in.	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

BRASS

Brass rods, base ½ in. to 1 in. rd.	0.55
Brass sheets, 8 in wide 20 oz.	0.60
Brass tubing, seamless	0.55
Copper tubing, seamless	0.55

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

RUBBER BELTING

Standard	50%
Best grades	30%

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy	.35
Copper sulphate	.24
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., May 20, 1916—No new developments have transpired in the industrial situation during the past week. The effect of the enormous business resulting from war conditions, has been to steadily improve the general domestic situation, and the outlook for the future is encouraging. Increased interest is being shown in the development of foreign trade, and steps are now under way which will strengthen the mutual feeling already existing between the industrial forces of this country and those of our allies.

Pig Iron

The situation is unchanged, but owing to the strikes now prevailing in various sections of the States, the consumption of foundry iron has been materially reduced and prices have declined. Pittsburgh is quoting 30 cents lower on No. 2 foundry.

Steel

While the steel situation is comparatively unchanged, the general conditions show an easier tone, as the demand on future positions appears to be diminishing. Price quotations are holding firm, and in view of the fact that daily advances are no longer the rule, the conditions may be said to be improving.

While the demand for open-hearth steel is relatively as great as ever, unexpected offerings have materially reduced the tension under which the market has been laboring for nearly a year. This development has resulted in a decline of $5 a ton on billets and sheet bars, Pittsburg; a similar decline is noted in forging billets.

No price changes are noted this week in sheet quotations. Conditions in cold rolled strip are stronger and higher prices are apparently pending. The wire market is firm and steady and the demand is good with the exception of barbed wire which has shown signs of easing up. Makers of boiler tubes are well filled for this year's business especially on seamless tubing, which in some cases is booked into 1917.

Metals

Copper has taken on a little strength and the demand continues good. Tin is quiet at present, but consumption is still heavy and prices are firm. The spelter situation has started on a slide which at the present time, is difficult to define. Lead continues quiet, but remains firm. Antimony is declining every day and the supply is increasing.

Copper—Increased interest on the part of consumers and further export inquiries have added strength to the market, but no hevay buying has as yet developed.

London cables report a strong market on advancing prices, and quotations on standard spot has advanced £2 during the week; futures show an increase of £6 while spot electro is quoted £4 higher. This week's prices are £143; £141 and £158 respectively.

New York quotes 29½ for prime lake; 30 for electro and 27½ for castings; these prices being an advance of ½ cent lake and a decline of ½ cent on castings and electrolytic.

Local dealers report a fair market with conditions unchanged. Prices are firm at 33 cents for lake, 32½ for electrolytic and 31 for castings.

Tin.—While the present market is dull and quiet, consumption continues very heavy, the tin plate producers being exceptionally busy in meeting the demand for tin plates both for home and foreign marktes.

The London market is quiet and prices are easier;a decline of 15 shillings on spot and 5 shillings on futures, leaves the quotaion this week at £197-5 shillings and £197-10 shillings respectively. New York reports an advance of ¼ cent on a quotation of 49½ cents per pound.

Dealers here are quoting last week's prices on a quiet market, 49 cents per pound.

Spelter.—The decline in spelter continues and the question now before the market appears to be the extent of the present slump. Recent reports that the production of spelter was exceeding the

demand have resulted in the gradual decline, and consumers cannot be induced to buy while daily reports show a weakening market. Producers are busy at present, but unfilled orders are on the decrease.

London markets are very quiet on sharp declines, spot having fallen off £4 during the week and future £7 off; quotations now being £95 and £85 respectively. New York reports show a decline of 1⅜ cents per pound, being quoted at 15.425 per pound.

Local conditions are similarly affected and the market is exceptionally quiet on declining prices. A decline of 1 cent leaves this week's quotation at 19½ cents per pound.

Lead.—The situation at present is quiet and in the face of a weaker market in London, early future foreign business will be curtailed. Reports of considerable new business, however, have kept the market here fairly firm and prices are stationary.

Lead in London has shown a decline on the week of £2 12 shillings, spot being quoted at £31 12½ shillings with futures 5 shillings easier. This weakness however has not yet affected the American market, New York still quoting 7½ cents per pound.

Prices here are unchanged but with an easier tone, this week's quotation being 9¼ cents per pound.

Antimony—This market is quiet and still on the decline. Consumers are showing little interest in the situation and further declines are not unlikely. New York reports a decline on the week of 5 cents, the present price being 30 cents per pound. Following the action of foreign interests local dealers have also declined on antimony, this week's quotation of 41 cents showing a drop of 3 cents per pound.

Aluminum.—The situation is unchanged with prices firm at 68 cents per pound.

Machine Tools and Supplies

The principal purchasing at present is on small orders for single machines. The eagerness of buyers is not so pronounced as a few months back, and the demand for machinery of the special purpose type is now being replaced by inquiries for standard machines. The situation as regards supplies shows no change, high prices and limited supply still prevailing.

Old Materials

Dealings in scrap metals appear quite active, but quoted prices in many instances are being shaded. Activity in scrap zinc is falling off. Aluminum scrap is active following a period of dullness. A decline of ¼ cent is noted in tea lead and scrap zinc is ½ cent lower. Other metals and material are comparatively active with quotations firm.

Toronto, Ont., May 23.—Trade continues active all over the country and a better feeling prevails in business circles generally. Annual reports of the many companies issued nearly all bear witness to the wave of prosperity that is passing over the Dominion, some of these concerns being only as a matter of fact indirectly benefited by war orders. The fact that these conditions will end sooner or later is being more fully appreciated by manufacturers who are becoming more united in their efforts to develop markets outside Canada. The possibilities of development in the export trade during abnormal times has already been proven and the opportunities of opening up new markets have never been more favorable. Some concerns are doing a big export business as a result of individual effort, while other organizations have also been most successful in securing business from various parts of the world. The experienced gained now should help considerably in retaining a hold in those markets after the war when conditions become more normal. The Canadian Commission which will meet in London, England, early in June is another step towards the development of export trade. The closer commercial union between the Empire and our Allies will be a distinct advantage to Canada and will be productive of wider markets and consequently a large volume of trade.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

There is no improvement in the situation as regards shortage of labour and raw material. The problem will become difficult to solve as time passes there being no prospect of any relief this year, at least. Enlistments are drawing men from the factories and production is being curtailed in consequence. The increasing demand for iron and steel is greater than the mills can take care of, the result is that these commodities cannot be obtained in sufficient quantities to cover the requirements of the manufacturers of finished products. In this case there appears to be little if any possibility of improvement in the situation during 1916, as the mills are already booked up for the fourth quarter, and in some cases well into 1817. Prices of all steel products are consequently high even if they do not advance much further they will in any case remain at a high level.

Steel Markets

The situation in the iron and steel market continues favorable. Quotations are steady but have still an upward tendency, although few price changes have been made during the week. The export demand is an insistent as ever and is keeping the market in a buoyant condition. The domestic demand is improving but is somewhat restricted owing to the delay in getting steel, deliveries being more backward than ever. The wrought iron pipe market is strong and prices firmly held with prospects of an advance in the near future; skelp is scarce and high in price. Boiler tubes are firm and deliveries are now running into the last quarter. Makers of shafting are practically sold up for the remainder of the year, and prices are very firm and unchanged. Plates have advanced 25c per 100 lbs. and are now quoted as follows: plates ¼ in. to ½ in., $4.25; heads, $4.50, and tank plates 3-16 in., $4.75 per 100 lbs.

The sheet market continues strong and prices will possibly advance. Inquiries for many weeks have embraced tonnage far beyond the capacity of the mills. The demand for blue annealed sheets is particularly heavy, while deliveries on black sheets are also very backward. The galvanized sheet market is unchanged and little hope is entertained by most makers for an early improvement. The spelter market is unsettled and the price is still too high to interest the galvanizers, for this reason many plants are operating at considerably reduced capacity.

The steel market in the United States is steadier than it has been for many months and may have reached the top point. It is thought however that it will be several months before prices begin to decline as the demand for steel is still very great, and is likely to remain so for a considerable time. There appears to be little danger of any marked weakness developing in the market, even after the war, as there will be a big demand for steel in Europe during the period of reconstruction, and the mills in the States and also in Canada will be called upon to furnish heavy tonnage of steel products. Prices are generally firm but unchanged this week. Steel bars are quoted at 3c, plates, 3.75c, and shapes 2.60c, f.o.b. Pittsburgh.

Pig Iron

The market continues firm and the situation generally is unchanged. The consumption of steel-making pig iron is as heavy as ever, while foundry grades are in better demand. Quotations are firm and unchanged.

Old Materials

The market is steady with a fair demand for scrap copper and heavy melting steel at unchanged prices. Both lead and zinc are weaker but quotations are practically the same as last week. The market has a better undertone and an improved demand is expected for some old materials.

Machine Tools

It is highly probable that the railways will be in the market at no distant date for new equipment for their car plants. A part of the government subsidies may be appropriated for this purpose, as the railways have been out of the market so long that new machine tools will be required. The large order for freight cars recently placed by the Dominion Government for the Intercolonial Railway will no doubt bring the car companies in the market for some equipment. Inquiries for single purpose lathes and other special tools for munition plants continue fair, but the backward deliveries on standard tools is tending to restrict the volume of business.

Supplies

A good demand for most lines of machine shop supplies is reported, and prices continue to have a higher tendency although there are no changes of particular importance to note this week. Putty advanced 15c and is now quoted at $3 per 100 lbs., in drums. Turpentine is steadier but the linseed oil market is still weak and unsettled. Oil is being quoted by some dealers at 89c-92c, but others are quoting 85-88c for raw and boiled oil respectively.

Metal Markets

There has been no development of any particular importance in the metal markets since the last report. Outside of a brisk demand for copper and continued strength in that market, the general tendency has been quiet, with the single exception of antimony which is lower; quotations are unchanged this week. Business locally is good, the demand for lead, copper and antimony being heavy.

Copper.—The market is quiet but the general situation has undergone no change and continues strong. There is reported to be a great shortage of copper in Europe which should result in heavy buying in the near future. Quotations are unchanged and nominal at 32c per pound.

Tin.—The market is steady and dull with quotations unchanged. The problem of getting licenses to ship tin from England is still an important factor in the situation but it is believed that permits will be granted with greater freedom in the future. Tin locally is nominal and unchanged at 54c per pound.

Spelter. — The market is dull and easy. Producers are said to have sufficient business booked to keep them busy for another month but their unfilled orders are steadily decreasing. Consumers are keeping out of the market although there is considerable buying in prospect. Spelter is weak and unchanged at 21c per pound.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

Lead.—The London market is weaker and New York dull and easy. The "Trust" price is unchanged at 7.50c, New York. Some large business is reported to be pending which will stiffen the market. Local quotations are unchanged at 9½c per pound.

Antimony.—The market is weak and lower. Consumers are showing no interest in the market. Antimony has declined 1c and is now quoted at 44c per pound.

Aluminum.—The market is quiet but firm and quotations are unchanged at 68c per pound.

TEXTILE MACHINERY

TEXTILE machinery, says a recent issue of the British Trade Review, is in request, and export orders are coming well to hand. Trade has improved greatly Difficulty is being met with in the fulfilment of orders by engineering firms owing to shortage of skilled labor and higher costs of raw material. One large Belfast firm with good Dundee connection has secured a considerable volume of new orders, and has booked contracts at remunerative prices. Foreign orders are also receiving attention, and shipments are being made abroad. The firm in question specializes in all kinds of machinery dealing with jute, flax, hemp, manila, and sisal.

Orders for bag-making machinery have been well in evidence—sack cutting, sewing, and printing, and for a time works had delay in executing the contracts for manufactories. Extensions of engineering establishments have taken place, and several are now in hand. There is a constant inquiry for new up-to-date plant, such as large modern carding machines for the jute and flax industries.

Orders from Calcutta are to hand, and consignments are sent out, chiefly spare parts and replacements, also looms to meet the demand for extension. An important order for a mill extension in Calcutta—engines, boilers, shafting, and machinery—was delayed, and building operations had to wait until the necessary plant could be sent out from Great Britain. Dyeing and cloth-finishing plant has also been booked in considerable volume, and extensions of these departments in factories have given occasion for good orders. The great improvement of trade has led to the installing of the newest type machinery to economize labor charges and augment output.

TO BUILD VESSELS IN B. C.

CONTRACTS were awarded on May 19, to the Wallace Shipyards of North Vancouver for the construction of three steel vessels, the hulls to cost about $400,000. Machinery, which will include large oil engines, will be additional. The boats are to be used in the lumber carrying trade from British Columbia ports, and are to be built under an interest guarantee of the British Columbia Government.

H. W. Brown is in charge of the contracts, and associated with him are H. M. Wolverin, a Great Lakes transportation man; James Carruthers, president of the Canada Steamship Lines; G. W. Norcross, of Montreal, vice-president and managing director of the Canada Steamship Lines; James Whalen, of the British Columbia Sulphite Co., and president of the Western Drydock & Shipbuilding Co., of Port Arthur; M. J. Haney, of Toronto, capitalist and contractor, and Sir Trevor Dawson, managing director of the famous Vickers Ltd., of Great Britain.

RISK OF TRANSSHIPMENT

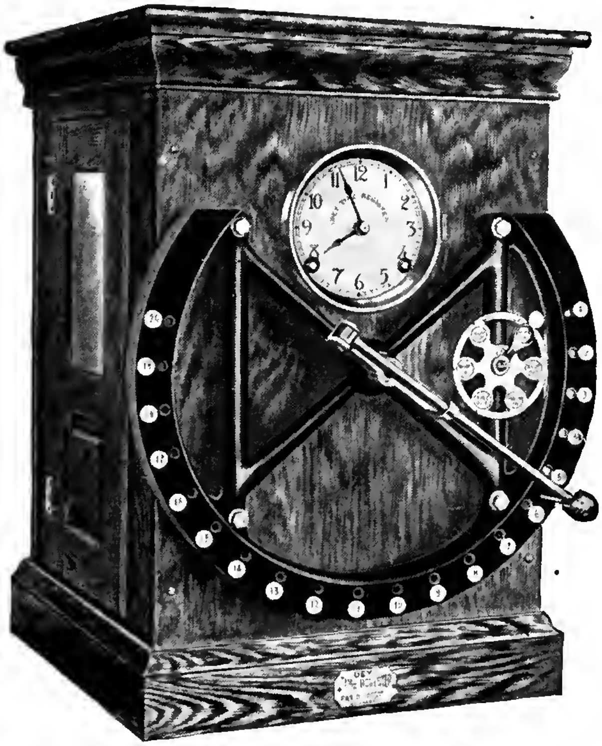
WHERE a shipment is made to a foreign port, with transshipment at an intervening port, the risk of transshipment is borne by the shipper and not by the carrier, except where gross negligence on the part of the carrier can be proven.

Here's the way to save a year's dividends

You have competitors? Yes! Look around and you'll see they use International Time Recorders. That's why they are SUCH competitors.

There's no argument about "working time" being the greatest of all raw materials you buy, yet many manufacturers permit four leaks a day in the supply every man on their pay-roll sells them.

"Walking time"—there's the biggest leak. The time the employees take *after* ringing in on the Recorder and *before* they get to work.



Check this loss. Put an International Time Recorder at the door of each department. Then it's up to the foreman to see that every man is busy at his bench or machine—and he'll do it.

Our big, new Canadian factory is prepared to make a Time Recording system to exactly suit any business—even yours.

Prices and new literature on request. Write to-day for it. No time like the present to start saving money.

International Time Recording Company of Canada, Limited

Toronto: Anderson St. **F. E. MUTTON, Manager**

Montreal: W. A. WOOD, Sales Agent
Corner McGill and Cartier Streets

If any advertisement interests you, tear it out now and place with letters to be answered.

SOUTH AMERICAN TRADE OPPORTUNITIES

THAT Canadian manufacturers may, if they seize the opportunity, gain a very valuable trade in South American countries which hitherto have received a very large proportion of their supplies of manufactured goods from Germany is the opinion of J. Enoch Thompson, Spanish Consul in Toronto. The field in the southern continent of America, he says, is simply waiting for the advances of salesmen from this and other countries. Germany has been cut off nearly altogether from South America, and in order to introduce Canadian-made goods into that territory the manufacturers of Canada must aim first to adapt themselves to the needs and demands of the people of the Central and South American countries, which are chiefly Spanish-speaking.

The annual imports of these South American peoples amount to 1,600 million dollars, and much of this huge volume of trade could be supplied from Canada. For example, Argentina, Brazil and Chili import annually the following articles:

Argentina

Agricultural machinery and tools	$10,000,000
Soap	600,000
Cheese	2,000,000
Leather goods	2,000,000
Paper	10,000,000
Pianos	1,300,000

Brazil

Wheat and flour	$20,000,000
Butter, cheese and provisions	7,000,000
Pianos	800,000
Ships	5,000,000
Sewing machines	1,500,000
3,338 pianos	1,000,000

Chili

Animals and animal products	$ 7,000,000
Agricultural implements	1,500,000
Paper	3,000,000
Cotton goods	11,000,000
Lumber and furniture	2,000,000

If our manufacturers and exporters wish to extend their trade to Spain and South America they have an opportunity now which may never again occur," declared Mr. Thompson. "To take advantage of it they must issue Spanish catalogues and correspond in that language, following it up by sending representatives who speak Spanish. Here is what a Venezuelan paper, El Fonografo said, six months ago, quoting a Mr. Serret, a Frenchman, who has lived many years in South America, who explains first the causes of the commercial preponderance acquired by Germans in South America. He affirmed that they owed it to their method, their power of adaptation and their lack of scruples, which distinguish them, as well as the paternal solicitude of the Imperial Government.

On the navigable waters of all the coasts, especially of the South Pacific, until August, 1914, were seen innumerable German vessels which, thanks to the generous subvention given by their Government, could cut freight rates much below standard rates and thus secure most of the important cargoes."

CANADIAN COMMERCIAL INTELLIGENCE SERVICE

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC

H. R. Poussette, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALASIA

D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES

E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA

J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA

Acting Trade Commissioner, Lonja del Comercio, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE

Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Standacona.

JAPAN

G. B. Johnson, P.O. Box 109, Yokohoma. Cable address, Canadian.

HOLLAND

Acting Trade Commissioner, Zuidbaak, 26, Rotterdam. Cable address, Watermill.

NEWFOUNDLAND

W. B. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND

W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA

W. J. Egan, orwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM

Acting Trade Commissioner, Sun Building, Clare Street, Bristol. Cable address, Canadian.

J. E. Ray, Central House, Birmingham. Cable address, Canadian.

J. Forsythe Smith, Fruit Trade Commissioner, North British Building, East Parade, Leeds. Cable address, Canadian.

F. A. C. Bickerdike, Canadian Chambers, 36 Spring Gardens, Manchester. Cable address, Cantracom.

J. T. Lithgrow, 87 Union Street, Glasgow, Scotland. Cable adress, Contracom.

Harrison Watson, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London.

SPECIAL TRADE COMMISSIONER—LUMBER

H. R. McMillan, visiting Europe, Africa, Australasia and the Orient.
C. F. Just, Russia.

CANADIAN COMMERCIAL AGENTS

BRITISH WEST INDIES

Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian.

R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK

C. E. Sontum, Grubbegad No. 4, Christiania, Norway. Cable adress, Sontums

SOUTH AFRICA

D. M. McKibbin, Room 34, Permanent Buildings, Harrison Street, Johannesburg.

E. J. Wilkinson, Durban, P.O. Box 673, Durban, Natal.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM

W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England.
Cable address, Dominion, London.

DON'T WASTE TIME PUZZLING OVER YOUR TAPPING PROPOSITION

Submit it to us, and our Experts will tell you how it can be done
TO YOUR BEST ADVANTAGE

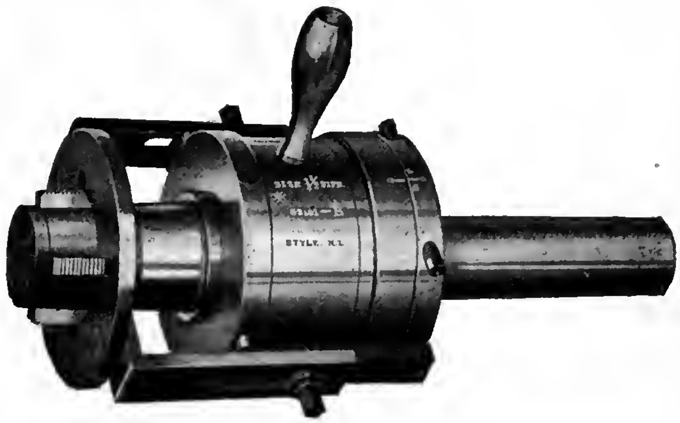
Geometric Collapsing Taps are arranged for all classes of thread tapping above ¾-inch diameter. Rigid while tapping, but collapse the chasers when the required depth is reached. Can be fitted to screw machine or turret lathe, also to live spindle, such as a drill press.

Let us send our booklet describing these Geometric Collapsing Taps in a general way, or, with your specifications at hand, we will describe your Tap in particular.

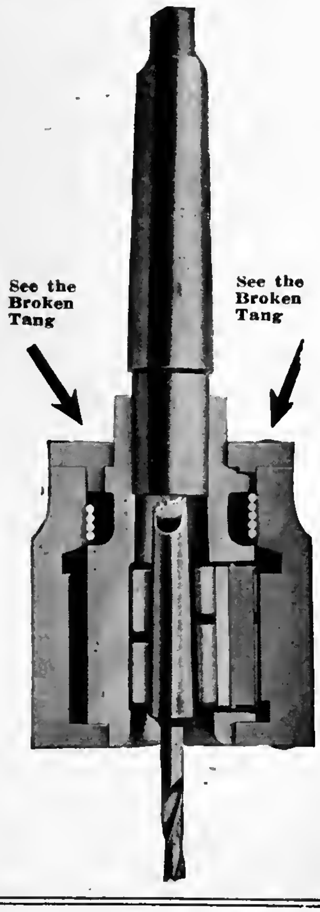
The Geometric Tool Company

New Haven, Conn., U.S.A.

Canadian Agents: Williams & Wilson, Ltd., Montreal
The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, and St. John, N.B.



Geometric Collapsing Tap, Class "N-L," Equipped with Chasers for Plug Tapping



Don't Throw Away Broken Tang Drills

Perhaps you are about to discard some taper shank drills because the tangs are broken off —DON'T DO IT—they are worth their weight in gold. You can use them just as they are with a

Wahlstrom Automatic Chuck

One chuck holds drills from 1/16" to 1¼"

and you won't have to take time from your production to repair them.

Tool changes are made in two seconds—just grasp the shell of the chuck with one hand and put in or remove the tool with the other—no collets—no lost time, for the spindle never stops.

The jaws grip NOT BY THE TANG, BUT ON THE SIDE OF THE TAPER—there's no chance for slippage—a Wahlstrom won't even mar the shanks.

CANADIAN DEALERS:
Aikenhead Hdw. Co., Toronto, Ont., Canada
Williams & Wilson, Ltd., Montreal, Quebec, Canada

Wahlstrom Tool Company

350 Carroll Street Brooklyn, N.Y., U.S.A.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Hamilton, Ont.—M. Brennan & Sons are in the market for a nailing machine.

Watrous, Sask.—The Watrous Electric Light Co. will install a new gas producer plant.

Toronto, Ont.—J. T. Hepburn Co., are building an addition to their machine shop on Van Horne Ave.

Montreal, Que.—H. Morgan & Co., 16 Beaver Hall Hill, will build a brick and concrete garage to cost $10,000.

Niagara Falls, Ont.—The American Cyanamid Co. have started work on a plant to cost $20,000. H. P. Eastman is manager.

Ruscomb, Ont.—William Lockhart is considering the erection of a plant for the manufacture of brick, tile, etc., to cost $10,000.

Brantford, Ont.—The American Radiator Co. has been granted a permit for the erection of an addition to its plant, to cost $8,000.

Chatham, Ont.—After some delay in the delivery of steel for the plant of the Dominion Sugar Co., delivery of several carloads of material has begun.

Vancouver, B.C.—The City Council will install a 4-in. pump, including motor, at the Parker Street pumping station. F. L. Fellows is the engineer.

Penetang, Ont.—The Dominion Stove & Foundry Co. is making extensive additions to its plant, and will install equipment for the manufacture of furnaces, etc.

Vanvouver, B.C. — The Begg Motor Co. will have an addition built to its plant immediately at a cost of $15,000. The Dominion Construction Co. is the contractor.

Medicine Hat, Alta.—The Lake of the Woods Milling Co. will build a large steel and concrete mill to replace the one recently destroyed by fire with a loss of $200,000.

Cobalt, Ont.—The Trethewey Mining Co. is at the present time experimenting with the treatment of tailings from the mill dump. A small flotation plant may be installed if the experiments are successful.

St. John, N.B.—Work has started on the foundaton for the new foundry and machine shop for the T. McAvity & Sons, Grant and Horne of this city are the contractors for the new buildings which will cost over $100,000.

Port Arthur, Ont.—Fire recently damaged the pattern storage at the plant of the Western Dry Dock & Shipbuilding Co. The loss of the building is estimated at $25,000, but a large number of valuable patterns were destroyed.

Edmonton, Alta. — The Provincial Legislature has ratified an agreement between the Edmonton Power Co., care G. W. Farrell & Co., Montreal, Que., and the Edmonton City Council, for the supply of power for 21 years. The company will construct a power house, large dam, electric railway and other works at a cost of $6,000,000.

Galt, Ont.—The Goldie & McCulloch Co. are making extensive improvements to their south plant, and work has already been commenced by the contractors. Secord and Sons of Brantford. At the rear of the office a power house is being erected. Alterations to the office are also planned. The cost of the extensions as estimated at about $55,000.

Municipal

Chatham, Ont.—The City Council have decided to buy a motor truck for the fire department.

Stratford, Ont.—The local Hydro-Electric Commission contemplate installing three 750 k.w. transformers.

Ottawa, Ont. — The appointment of City Commissioner is under consideration at a salary of $6,000 per annum.

Gananoque, Ont.—The Town Council contemplate making extensions to the waterworks system.

St. John, N.B. — The City Council contemplate making considerable improvements and extensions to the water distribution system.

St. John, N.B.—The city council are considering the installation of a incinerator. The work will probably be proceeded with this year.

Brantford, Ont.—The city council have passed on to the ratepayers a by-law to issue debentures for $58,000 for hospital extensions, the vote to be taken June 26.

Estevan, Sask.—A by-law will be voted on by the ratepayers to raise $5,000 to pay for the completion of the electric power plant.

Point aux Trembles, Que.—The town council have under consideration a number of civic improvements, including the installation of a waterworks system.

New Glasgow, N.S.—The Town Council is considering the purchase of two new chemical wagons, one with engine, wagons and hose, and the other for ladders and hose.

Wyoming, Ont.—The village council decided at a special meeting held on May 13, to sell the present gasoline lighting system in the town hall and substitute the hydro-electric.

Yorkton, Sask.—The town council will proceed with the installation of a second 500 h.p. unit in the municipal power house without delay. The plant will then have a capacity of 1,150 h.p.

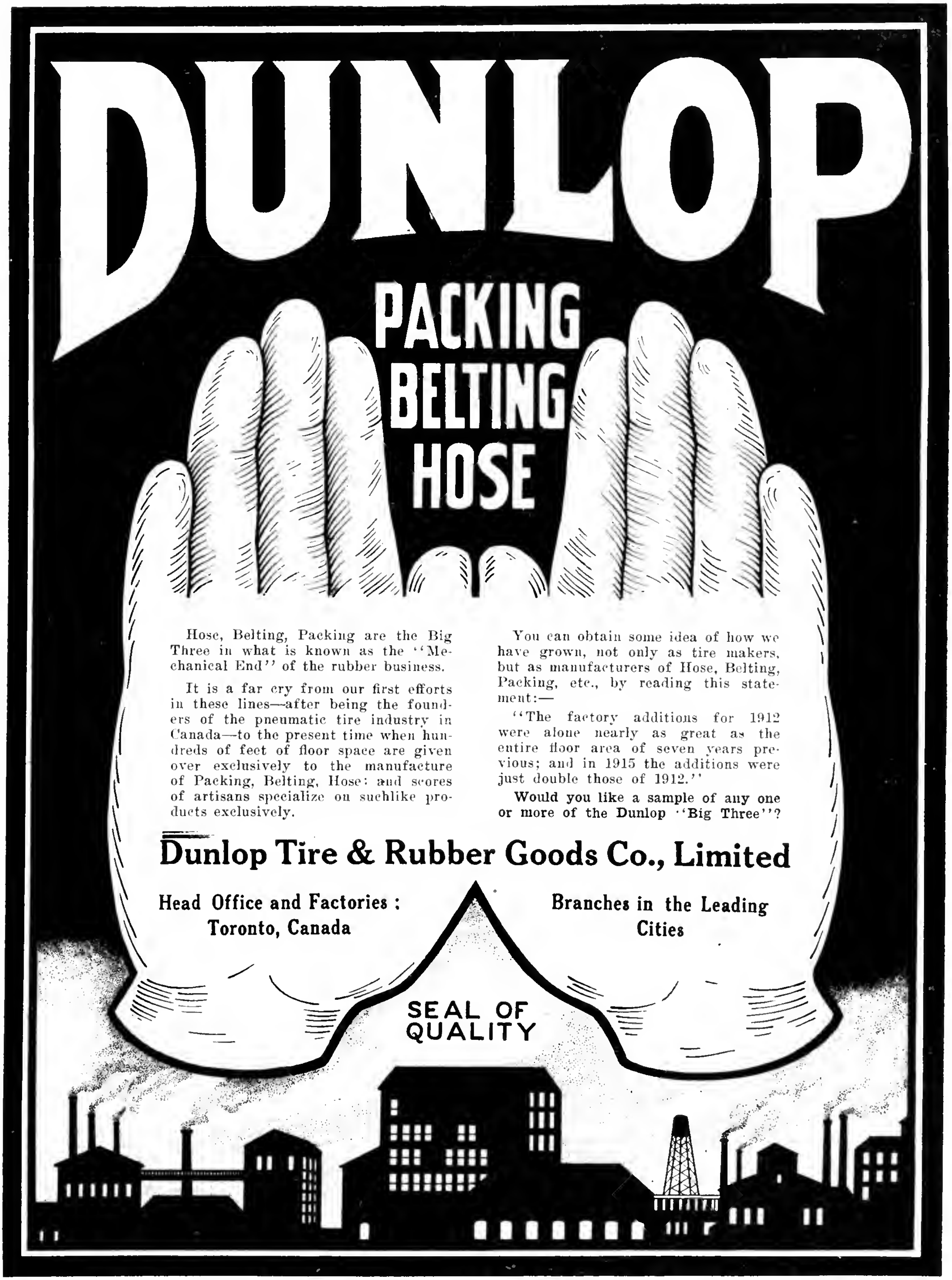
Loan to Paper Mills.—The by-law authorizing the loan by the town of Campbellford to the Northumberland Paper & Electric Co. of the sum of $30,000 to assist them in the rebuilding of their paper mills recently destroyed by fire, was carried by a very large majority on May 22.

Saskatoon, Sask.—The authority of the Local Government Board for the proposed expenditure on the incinerator and site, is likely to be delayed, as the chairman of the Board seems to be of the opinion that the Public Health Commissioner should be consulted in the matter.

Welland, Ont.—County Clerk Cooper has received notice from the Minister of Public Works that the country is authorized to spend up to $100,000 this year on good roads construction, and $12,000 for repairs. He advises, however, that construction be kept down to the lowest possible figure meantime.

Scarboro, Ont.—The Township Council has decided to erect a modern municipal building, which will house the various township offices and will also contain an ample council chamber. While no plans or specifications have been drawn as yet, it is stated that the proposed new structure will be one of the most up-to-date municipal buildings in the county and will cost over $5,000.

Orillia, Ont.—The by-law for transferring Orillia's power plant to the Ontario Hydro-Electric Commission, submitted to the ratepayers on May 22, was defeat-


DUNLOP
PACKING
BELTING
HOSE
Hose, Belting, Packing are the Big Three in what is known as the "Mechanical End" of the rubber business.
It is a far cry from our first efforts in these lines—after being the founders of the pneumatic tire industry in Canada—to the present time when hundreds of feet of floor space are given over exclusively to the manufacture of Packing, Belting, Hose: and scores of artisans specialize on suchlike products exclusively.
You can obtain some idea of how we have grown, not only as tire makers, but as manufacturers of Hose, Belting, Packing, etc., by reading this statement:—
"The factory additions for 1912 were alone nearly as great as the entire floor area of seven years previous; and in 1915 the additions were just double those of 1912."
Would you like a sample of any one or more of the Dunlop "Big Three"?
Dunlop Tire & Rubber Goods Co., Limited
Head Office and Factories: Toronto, Canada
Branches in the Leading Cities
SEAL OF QUALITY

ed by an overwhelming majority, the vote standing 513 against the by-law to 79 for it. Though it was admitted that the town would gain financially under the proposed arrangement, the townpeople were strongly opposed to giving up control of their generating plant, which has been in operation for nearly fifteen years. The town will now have to proceed with the completion of their new plant at the Swift Rapids, at an estimated cost of $90,000.

Tenders

Charlottetown, P.E.I.—Tenders are being called for an oil engine-driven pump for the waterworks plant. Tenders for a boiler may be called for within a few weeks. R. S. & W. S. Lea, of Montreal, are the consulting engineers, from whom particulars may be obtained.

Weyburn, Sask.—Tenders will be received up till June 1, addressed to the City Commissioners, Weyburn, for the supply and erection of one 500 k.w. steam turbine, generator, switchboard and auxiliaries.. All information may be had by applying as above.

Toronto, Ont.—Tenders will be received at the Department of Public highways of the Province of Ontario up to June 9, for the supplying of motor vehicle markers required for the year 1917. Specifications and forms for tender may be obtained from W. A. McLean, Deputy Minister of Highways.

Sarnia, Ont.—The Board of Education will receive tenders, until June 1, 1916, for the erection of an eleven-roomed school building. Plans and specifications may be seen at the Board of Trade Room, City Hall, Sarnia, or with the Architects, Messrs, S. F. Coon and Son, Ryrie Building, Yonge street, Toronto.

Toronto, Ont.—Tenders will be received by the Chairman, Board of Control, City Hall, up to June 6, for the supply and delivery of coal meters for measuring coal at Main and High Level Pumping Stations. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Winnipeg, Man.—Tenders will be received at the office of the Board of Control, up to June 5, for the supply of one combination gasoline pumping engine and hose wagon, with a pumping capacity of 700 gallons per minute, and capable of carrying 1,000 feet of 2½ inch fire hose. Form of tender may be obtained at the office of the chief of the fire department, Central Fire Station.

Ottawa, Ont.—Tenders will be received until May 31, for the construction of station, water tank, engine-house, transfer platform, standpipe pit ash-pit and turntable foundations for the Carleton Point Car Ferry Terminal, Prince Edward Island. Plans, specifications and form of contract may be seen at the office of the Chief Engineer, Department of Railways and Canals, Ottawa, the Chief Engineer, Canadian Government Railways, Moncton, N.B., and the Engineer in charge, Car Ferry Terminals, Carleton Point, P.E.I.

Wood-Working

Elmira, Ont.—The Elmira Planing Co. is building a new mill, to cost about $25,000.

St. Clothilde, Que.—A saw mill will be built here by the Bergeron Co. to cost about $5,000.

Simcoe, Ont.—The lumber and planing mill of Lewis Fick & Sons was destroyed by fire on May 11.

Montreal, Que.—S. W. Halliday, will build a carriage factory on St. Catharine Street, at a cost of $6,000.

Toronto, Ont.—The Ontario Show Case Co., West; Toronto is in the market for a wood-turning lathe.

St. Mary's, Ont. — The St. Mary's Wood Specialty Co., is in the market for a 16-in. buzz saw planer or joiner.

Building Notes

Toronto, Ont.—The McClary Manufacturing Co., will make addition to their warehouse at 177 King street West, at a cost of $3,000.

Toronto, Ont.—The Trusts & Guarantee Co. will erect an eight-storey office building on Bay Street, to cost about $50,000. Curry & Sparling, of Toronto, are the architects.

Toronto, Ont.—The City Council has decided to provide $30,000 for the Board of Education Administration Building, $38,000 for the High School of Commerce, and $284,395 for the Technical School.

Windsor, Ont.—By a majority of 346 votes the ratepayers sanctioned the expenditure of an additional $95,000 for the erection of a new Collegiate Institute building. The $100,000 which had previously been voted was not sufficient to cover the cost of the building.

Toronto, Ont.—A permit for the construction of the large mail order building on Mutual Street has been given to the Robert Simpson Co. by City Architect Pearce. The building, which will front on Mutual Street, will run back to Dalhousie Street, and will cost $400,000.

General Industrial

Toronto, Ont.—The Comfort Soap Co. will build an addition to the their factory to cost $4,000.

St. Catharines, Ont.—The McKinnon Dash Co. will build an extension to their factory here, to cost $70,000.

Port Hope, Ont. — A syndicate has taken over the old plant of the International Tool Steel Co., S. E. Brandon is interested.

Toronto, Ont.—The Flint Varnish & Color Works, Perth avenue, will erect a one storey brick and concrete factory, at a cost of $12,000.

Listowel, Ont.—The Canadian Mill Products Co., of Brownsville, Ont., will probably build a factory here at an approximate cost of $100,000.

Toronto, Ont.—Thompson-James Co., 43 Davies avenue, will build a one-storey brick factory at the east side of Broadview avenue near Wilton avenue, at a cost of $3,800.

Toronto, Ont.—The Wm. Neilson Co. will build an addition to their ice cream and candy factory at a cost of about $25,000. Sproat & Rolph, of Toronto, are the architects.

Montreal, Que.—Damage estimated at $30,000 was done by fire in the establishment of Louis Winstainer & Son, manufacturers of picture frames, 58 St. Lawrence Boulevard, on May 20.

St. Catharines, Ont.—The Dominion Food Co. have started work on the construction of a jam factory to cost $20,000. T. H. Wiley of St. Catharines is the architect.

Chatham, Ont.—At a special meeting of the City Council held on May 17, it was decided to grant to the American Pad and Textile Co., a strip of boulevard on Jeffrey street, ten feet wide at the rear of the plant. The company is planning the erection of a large addition at a cost of over $30,000.

Elmira, Ont.—A by-law authorizing a loan of $15,000 to the Colonial Knitting Co., has been carried by a majority of 264. The Knitting Co. comes from Guelph and will put up a large building. Machinery worth $25,000 is to be installed. The by-law to grant exemption of general taxes for 10 years to the Elmira Planing Mills Co., passed with 218 votes in favor and 60 against. A plant, 70 feet by 90 feet, all of concrete, will be erected.

Electrical

Stratford, Ont. — The local Hydro-Electric Commission has decided to install three transformers at a cost of $35,000.

Welland, Ont.—The Municipal Hydro-Electric Commission have asked the City Council for $12,000 to cover the cost of further extensions to the street lighting system.

Orillia, Ont.—The Hydro Electric Commission propose taking over the development at Swift Rapids. The Commission has offered the Town of Orillia $225,000 exclusive of transmission lines.

Orangeville, Ont.—Town Council has made the Cataract Electric Co. an offer of $7,000 for its distribution system in that town. Work on the hydro at that place is expected to commence at once.

Personal

George McKnight has been appointed city engineer of Fredericton, N.B.

R. M. Hannaford, assistant chief engineer of the Montreal Tramways Co., has been elected president of the Canadian Railway Club, Montreal.

Sir George Foster, Minister of Trade and Commerce, will leave for England probably this week and will be over there for some time.

J. E. Macfarlane has assumed the duties of general manager of the Western Canada Flour Mills Co. with headquarters at Winnipeg.

Thomas Roden, of Roden Bros., Toronto, has been elected chairman, and **L. L. Anthes,** of Anthes Foundry, vice-chairman of the Toronto branch of the Canadian Manufacturers' Association.

Lawn Smith, formerly of Dundas, Ont., has been appointed assistant engineer at the Curtis aeroplane works of Buffalo, N.Y.. Mr. Smith worked in the Chapman Engine Works at Dundas, Ont.

Fred W. Dunn, foreign manager of the Canada Cycle & Motor Co., Toronto, Ont., has sailed on a business trip from Vancouver, for New Zealand, Australia and the Orient. He will be absent six months.

W. Frank Hatheway has sailed from New York on the Kroonland for Europe. He is the only Maritime representative on the commission of Canadians recently appointed to inquire into the possibilities of after-the-war trade with Great Britain, France, Italy and possibly Belgium.

A. J. Moxhan, president of the Aetna Explosives Co., which has a plant at Drummondville, Que., has resigned and H. S. Kimball, president of the American Zinc, Lead & Smelting Co., has been elected president. Mr. Kimball will continue as president of the American Zinc, Lead and Smelting Co.

H. D. Scully, who has been secretary of the Canadian Manufacturers' Association and of the Munitions Section of the Canadian Manufacturers' Association, has resigned his position with these organizations in order to accept an important position with the Russell Motor Car Co. Mr. Scully will become secretary of the Russell Motor Car Co., and also secretary and a director of its subsidiary, the Canada Cycle & Motor Car Co.

Joseph A. Horne, a director of the Yale & Towne Mfg. Co., has been elected to the position of second vice-president, retaining also his present position and title of general superintendent. Mr. Horne, who has been over 24 years in the company's service, has the entire management of the works at Stamford, Conn., and of all manufacturing operations of the company, including those of its Canadian plant at St. Catharines, Ont.

Contracts Awarded

Ottawa, Ont.—The City Council have awarded the National Ironworks of Toronto, a contract for a quantity of cost iron pipe.

The Ferranti Co., have been awarded a contract by the City of Winnipeg for three transformers for the King St. substation of the light and power department at $9,650.

Burlington, Ont.—The town council have awarded a contract for a "Denby" motor fire truck to the Sherman Auto Garage of Hamilton, Ont. The truck complete with 200 ft. of chemical hose and ladders, etc., will cost $4,850.

Railways—Bridges

Fredericton, N.B.—The tenders for the construction of the uncompleted sections of the St. John Valley Railway are all in and the contract will probably be awarded shortly.

The Pas, Man.—Steel-laying on the Hudson Bay Railway on the last half of the road, was resumed on May 16 on the ninety-mile stretch between Manitou Rapids and Kettle Rapids. Contractors expect to have the track laid to Port Nelson by next summer at latest.

Name New Station "Petain." — In honor of the gallant French general who has been in command of the operations at Verdun during the terrific onslaughts delivered by the Germans, the junction point of the Kettle Valley Railway with the main line of the C. P. R., near the station of Hope, on the north side of the Fraser River, has been named "Petain." The appellation appears in the new summer schedules, which are now in the printers' hands, and will be issued shortly. The new time tables will become effective on June 4 as previously announced. The junction point of the Kettle Valley and the C. P. R. lines near Otter Summit, where the Spences Bridge branch of the latter road ends, has been designated Brodie as a compliment to H. W. Brodie, general passenger agent for the C. P. R.

Trade Gossip

North Vancouver, B.C.—A scheme is being considered by local interests which may result in a shipbuilding plant being established here.

Edmonton, Alta.—A workmen's Compensation Act is proposed for the Province of Alberta. It will likely be similar to a bill now before the B.C. Legislature.

Wiarton, Ont.—It is reported that the Crown Portland Cement plant will be sold, and instead of cement there will be manufactured magnesia, hydrate of lime, potash, etc.

Ottawa, Ont.—It is understood that the Canadian Northern Railway is in the market for equipment, and that contracts will follow the voting of the financial assistance now being asked from the Dominion Government.

Wallaceburgh, Ont.—The St. Clair Oil Co., a new concern just organized, with head office at Toronto, will take over and operate the Wallaceburg Oil Refinery in the near future. C. W. Yates, of New York, and R. G. Stitt, of Toledo, Ohio, are among those interested in the deal.

Barrie, Ont.—At the annual meeting of the Barrie Board of Trade held on May 19, the following officers were elected: Hon. president, P. J. Lynch; president, J. R. Hambley; vice-president, H. A. Sims; secretary-treasurer, Geo. D. Hubbard.

Rubber Seized.—Fourteen hundred parcels of rubber which were taken from the first-class mails on the Dutch steamer Gelria, while she was on her way from South America to Holland, were condemned in the British Prize Court on May 22. The parcels were said to be destined for Germany.

Saskatoon, Sask.—The Board of Trade may be represented at the conference of Chambers of Commerce of the Empire, to be held in London, England, on June 6, 7, 8, by Lt.-Col. H. W. Laird and

Major F. J. James. These two officers are at the present time on active service with the Canadian Army Service Corps in England.

Contract for Uniforms.—Contracts for 250,000 uniforms will be awarded by the Canadian Government within the next ten weeks, and will be shared by Canadian firms only. The drill and army duck required for these, it is said, can be obtained only from the Dominion Textile Co., so that it will add another to the many huge orders the Textile Co. are receiving.

The Sudbury Nickel Refineries, of Ottawa, has been Federally incorporated with a capital of $5,000,000. The company has the patent rights to a new process of nickel refining, and is said to be prepared to establish in Canada a big nickel refining industry, competing with the International Nickel Co., which is now arranging for a plant in the Maritime Provinces.

Bonus for Shipbuilding.—North Sydney, N.S., is going to make a bid for the establishment of a shipbuilding plant in the town. The council has adopted a resolution providing for the town furnishing a free site, tax exemption and other concessions tending to induce a company or persons to establish such a plant in the town: they even go so far as to offer a bonus.

Copper Refineries.—The ten copper refineries of the United States will have a combined annual capacity of 2,461,000,000 pounds upon the completion, within a few months, of increased facilities The plants of the American Smelting and Refining Co. and the Anaconda Copper Mining Co. will contribute the principal gains, the six refineries of these two companies to have a capacity of 144,000,000 lbs. of copper a month.

C. N. R. and Cunard Lines.—Cunard representatives visited Bristol recently and were given a reception by the Lord Mayor and the public bodies on taking over the Canadian Northern shipping. The new service will be inaugurated by the sailing of the Principello for Montreal. William Phillips, European manager of the Canadian Northern, expressed appreciation of the treatment of his company by the Cunard officials.

B. C. Boards of Trade Organize.—A special meeting of the Associated Boards of Trade of South-western British Columbia was held in the Vancouver Board of Trade rooms on May 13 to consider a resolution offered by the Vancouver Board of Trade providing for the organization of an association of Boards of Trade for the Province of British Columbia. The organization proposes to foster trade and assist in the development of the province.

Trade Commission Sails for Europe.—The Traveling Trade Commission, appointed by Sir George Foster, to visit Great Britain, France, Belgium, Italy and possibly Russia, has sailed for Europe, and will be absent for three or four months. Roy Campbell, a son of A. C. Campbell, of the Hansard staff of the House of Commons, and secretary of the Montreal branch of the Canadian Manufacturers' Association, is appointed secretary of the commission.

Government Orders Freight Cars.—It is understood that, in addition to the 30 locomotives ordered from the Canadian Locomotive Co., Kingston, Ont., for the Government Railways, orders for freight cars to the value of approximately $2,000,000 have also been awarded. The freight car order has been equally divided between the Canadian Car & Foundry Co., and the Eastern Car Co., New Glasgow, N.S. The cars are of a standard 50-ton type and are for use on the International Railway.

The Joliette Steel Foundries, recently destroyed by fire, has been taken over by a new company called the Joliette Steel Co. Kennedy Stinson is president., F. V. Moore, B.Sc., C.E., managing director, and G. B. LaForest, B.Sc., chemist The old plant has been rebuilt and remodelled with a capacity of 25 tons per day, to be immediately doubled however. A Bessemer converter has been installed. The head office is in the Read Building, Montreal, and operations started on the plant last week.

The Russell Motor Co., purposes to build a new factory at Weston, on twenty-eight acres recently purchased, to house the cycle and skate business. In the past, these branches of the company's activities have been handled in connection with the motor car plant at West Toronto. This has been turned over to the new Willys-Overland Co. of Canada, who require the whole premises for their business. Consequently the Russell Motor subsidiary, the Canada Cycle & Motor, must go elsewhere. The company is handling its fuse contracts at the city plant on Dufferin street. The factory, it is stated, will cost $100,000.

Grain Shipments.—The C. P. R. shows, in special publications, that 14,510,182 bushels of grain were shipped from Canadian ports at the head of the Great Lakes, during the last week in April, and that the total grain in store at the end of April, at the head of the lakes, was 28,197,921 bushels, compared with about 10,000,000 bushels a year ago. There is also much grain at inland points in the West, so that a busy season is anticipated. It is believed that the financial effects of the crop will be felt more this season than last, as the surpluses of wheat still unsold come upon the market.

May Subsidize Shipbuilding.—A subcommittee of the Cabinet is to be appointed shortly to deal with the question of the advisability and the means of Federal assistance for the development of the shipbuilding industry in Canada. This question was discussed on several occasions during the recent session, principally on behalf of the Canadian shippers, who have been encountering difficulties through the shortage of ocean tonnage. The appointment of a Ministerial Committee to deal with the question will be followed by a careful study of the problems surrounding the building up of a Canadian shipbuilding industry.

The Export Association of Canada, Montreal, which was organized a few months ago for the purpose of securing orders for Canada from the other portions of the British Empire and the Allied countries, has booked actual orders with Canadian firms within the past few weeks aggregating more than half a million dollars. This amount could have been increased many fold but for the scarcity of ocean transportation. That the association has been so successful in spite of the scarcity of space and the abnormally high prevailing freight rate should encourage Canadian manufacturers to prepare for export business. The association is sending a special representative to Siberia. He will go via Vancouver, and will open offices in Vladivostock, continuing his investigation and sales as far west as Omsk on the Trans-Siberian Railway.

Scholarships for C.P.R. Employees—George Bury, vice-president of the C.P. R., announces that two free scholarships, covering four years' tuition in the Faculty of Applied Science in McGill University, are offered to apprentices and other employees enrolled on the permanent staff of the said company, and under 21 years of age, and to minor sons of employees. The competitive examination will be held at the University, Montreal, and at other centres throughout Canada, in June. The candidates making the highest average and complying with the requirements of admission will be awarded the scholarships. The scholarship will be renewed from year to year, to cover a period not exceeding four years, if, at the close of each session, the holder thereof is entitled, under the rules, to full standing in the next higher year.

Plant Extension.—The Goldie & McCulloch Co., Galt, Ont., are making an addition to their South Works plant in the shape of a new power house. This will be thoroughly modern in every respect. It will be equipped with coal and ash handling apparatus, the coal being delivered to the bunkers direct from hopper-bottomed cars. The boilers will be

Goldie & McCulloch sectional water tube type, with superheaters and automatic stokers, and the engines will be Goldie & McCulloch vertical type, direct connected to d.c. generators. Besides the engines and generators, the engine room will contain the switchboard, a vertical air compressor and the usual condenser and feed pumps. These latter as well as the feed water heaters will be of Goldie & McCulloch make. A complete new hot water forced circulation heating system is to be installed for heating the present shop buildings. The pump for circulating the heating water will be of the centrifugal type driven by a Goldie & McCulloch steam turbine.

Refrigeration

Killarney, Man.—The Crescent Creamery Co., propose establishing a creamery here to cost $5,000. The town gives the company exemption from taxation on their plant for a period of five years.

New Incorporations

Edmonton, Alta.—The Alliance Power Co. has been incorporated to build and operate power plants, etc., $250,000 capital stock.

The Dominion Tygard Engine Mfg. Co., has been incorporated at Toronto, Ont., with a capital of $100,000 to manufacture steam or gas engines and accessories therefore. Head office at Toronto. Incorporators are Adam M. Cook and Irene House of Toronto.

The Miller Extracts, has been incorporated at Ottawa with a capital of $200,000 to manufacture, dyes, dyestuffs, tanning and other extracts. Head office at Montreal, Que. Incorporators, G. W. MacDougall, L. Macfarlane and W. B. Scott all of Montreal.

The Sarnia Creamery Co. has been incorporated at Toronto with a capital of $100,000 to manufacture ice cream and ice, and also pasteurize milk. Head office is at Sarnia, Ont., and the incorporators are: R. Sharpe, T. H. Lucas and J. W. Lawrence, all of Sarnia, Ont.

The Chemical Products of Canada, has been incorporated at Toronto, Ont., with a capital of $40,000 to carry on business as manufacturers of chemicals, drugs, colors, dyes. Head office at Toronto. Incorporators are Terence E. O'Reilly and George G. Grover of Toronto.

The Three Rivers Cold Storage & Ice Co. has been incorporated at Ottawa with a capital of $50,000 to carry on a cold storage and ice business at Three Rivers, Que. Incorporators: S. Malone, A. J. Gouin and F. H. Mahone, all of Three Rivers, Que.

The Shimer Cutter Head Co., of Canada, has been incorporated at Ottawa, with a capital of $50,000, to manufacture cutter heads, machine knives of all kinds at Galt, Ont. Incorporators: F. H. Palmer, Robert Polloch and Wardlaw Vair, all of Galt, Ont.

The Sanitary Heating and Ventilating Co. has been incorporated at Ottawa with a capital of $50,000 to manufacture electrical and heating appliances of all kinds. Head office to be situated at Ottawa. Incorporators: A. E. Adams, O. G. J. O'Regan, and J. H. Barker, all of Ottawa.

The National Wood Manufacturing Co. has been incorporated at Ottawa with a capital of $25,000 to operate mills for the working up and manufacturing of lumber and wood. Head office to be situated at South River, Ont. Incorporators: W. J. Ard, C. A. Jackman, and Albert Howard, all of South River, Ont.

The Lambton Flax Co., has been incorporated at Toronto, Ont., with a capital of $40,000 to carry on the business of flax, hemp and jute spinners, linen manufacturers. Head office at Petrolea, Ont. Incorporators are Richard V. LeSueur and Antony I. McKinley of Sarnia, Ont.

The Canada Clock Co. has been incorporated at Ottawa with a capital of $250,000 to manufacture clocks, electrical master clocks, electrical clock systems, etc. Head office to be situated at Toronto, and the incorporators are: E. M. Dillon, H. R. Frost and A. E. Grosch, all of Toronto.

The F. S. Carr Rubber Co. of Canada has been incorporated at Ottawa with a capital of $200,000 to manufacture rubber, automobile and carriage fabrics. Head office to be situated at Granby, Que., and the incorporators are: J. E. Day, J. M. Ferguson, and J. P. Walsh, all of Toronto.

The Detroit Mica Mining Co. has been incorporated at Ottawa with a capital of $150,000 to acquire and develop mineral lands and deposits. Head office to be situated at Windsor, Ont. The incorporators are: M. Harris and P. A. Miller, of Detroit, Mich., and J. Robinet, of Sandwich, Ont.

The Mutual Chemical Co., of Canada, has been incorporated at Ottawa with a capital of $49,000 to carry on the business of mining, milling, concentrating, in all kinds of ores. Head office at Sherbrooke, Que. Incorporators, C. W. Cate, J. P. Wells and C. D. White all of Sherbrooke, Que.

The Milton Pressed Brick Co., has been incorporated at Toronto, Ont., with a capital of $1,500,000 to manufacture every kind of brick and build-

ing materials and supplies. Head office at Toronto. Incorporators are Arthur W. Holmsted and Norman R, Kay of Toronto, Ont.

The Majestic Electric Co. has been incorporated at Ottawa with a capital of $50,000 to manufacture electric, gas, or other heaters, and electric supplies of every description. Head office to be situated at Toronto. The incorporators are: A. L. McLennan, R. McLennan, and J. A. Campbell, all of Toronto.

The Mutual Chemical Co. of Canada has been incorporated at Ottawa with a capital of $49,000 to carry on the business of mining, milling, smelting of all kinds of ores, etc. Head office to be situated at Sherbrooke, Que. Incorporators: C. W. Cate, H. P. Wells, and C. D. White, all of Sherbrooke, Que.

The Canadian Drawn Steel Co. has been incorporated at Ottawa with a capital of $500,000 to carry on the business of steelmakers, steel converters, steel drawers, etc. Head office to be situated at Hamilton, Ont., and the incorporators are: R. K. Hope, H. J. Waddie, and S. D. Biggar, all of Hamilton, Ont.

The Vulcan Asphalt & Supply Co. has been incorporated at Ottawa with a capital of $10,000 to carry on the business of manufacturing building materials, paper, asphalt, oils and other mineral substances. Head office to be situated at Winnipeg. The incorporators are: R. F. McMillin, W. A. Stapley, and J. H. Russell, all of Winnipeg.

The Quality Canners of Canada have been incorporated at Ottawa with a capital of $250,000 to carry on business as a manufacturer of preserved fruits and vegetables, pickles and soups, etc., at Windsor, Ont. Incorporators: E. C. Awrey, of Leamington, Ont.; Wm. Henry Furlong, of Windsor, Ont., and W. Wall, of Merlin, Ont.

The Globe Shock-Absorbing Tire Co., of Canada, to be incorporated at Toronto, Ont., with a capital of $1,000,000 to manufacture a resilient or shock-absorbing vehicle, automobile and commercial tire. Head office to be at St. Catherines, Ont. Incorporators are Isaac Normandy and Howard J. Ecclestone of St. Catherines.

The Canadian Fire Hose Co., has been incorporated at Ottawa with a capital of $40,000 to manufacture fire apparatus and extinguishers, including signal systems. Head office to be situated at Montreal, Que. Incorporators, S.H.R. Bush, J. S. Lamarre and E. C. Baker all of Montreal.

The McArthur Belting Co. has been incorporated at Ottawa with a capital of $40,000 to acquire the business of D. J. McArthur & Co., manufacturers of

leather beltings. Head office to be situated at Brockville, Ont. Incorporators: J. D. McArthur and J. S. McArthur, of Brockville, Ont.

The Sudbury Nickel Refineries, has been incorporated at Ottawa with a capital of $1,000,000 to carry on the business of producing, reducing, refining ores, metals, etc., and all other reducible substances. Head office to be situated at Ottawa, Ont. Incorporators, L. P. Burrows, E. Seybold and W. C. Perkins all of Ottawa, Ont.

The Dominion Ivory Co. has been incorporated at Ottawa with a capital of $50,000 to manufacture ivory imitation goods, waterproof goods, rubber, cotton goods and fabrics, etc. Head office to be situated at Toronto. Incorporators, S. L. Kenyon and H. R. Bemis of Springfield, Mass., and Newton O. Harvey, of Toronto.

The Goderich Manufacturing Co., has been incorporated at Toronto, Ont., with a capital of $100,000 to carry on a general manufacturing business, including therein all kinds of woodenware, furniture and articles which can be manufactured out of wood or iron. Head office at Goderich, Ont. Incorporators, are John E. Baechler and Jacob J. Baechler of Goderich, Ont.

The Studebaker Corporation of Canada has been incorporated at Ottawa with a capital of $400,000 to manufacture automobiles, boats and vessels operated or controlled by electricity, gasoline, steam, gas, or compressed air. Head office to be situated at Walkerville, Ont., and the incorporators are: C. DeLacy Fleming, of Detroit, Mich.; A. Leslie and H. L. McDowell, of Walkerville, Ont.

Marine

Ottawa, Ont.—The estimates include an appropriation of $100,000 for the construction of a pier at Port Stanley, Ont., and $32,000 to repair the piers at Port Burwell, Ont.

Chatham, Ont.—The announcement has been made by the Hon. Robert Rogers, Minister of Public Works, that the Government will take steps to dredge the River Thames to a depth of fourteen feet.

Port Arthur, Ont.—The Massey Steamship Co. has purchased the United States-owned steamers Panther and Caledonian, and will put them under Canadian register and in the Canadian lake service.

Yachtsmen Enlist.—About eighty Toronto yachtsmen has joined the Royal Naval Auxiliary Patrol Motor Boat Service, for which recruits are being enlist-

ed by Commander F. P. Armstrong, R. N. V. R., at his office in that city.

Vancouver a Grain Port.—On May 19, for the first time, the machinery of the new Dominion Government grain elevator at Vancouver handled grain. Two cars of wheat were unloaded and stored, and Vancouver entered upon its career as a grain handling port.

Ottawa, Ont.—Supplementary estimates tabled in the House of Commons on May 2 include an additional $200,000 for Vancouver harbor, $200,000 for Fraser River improvements, and $20,000 for improvements to the lower Fraser. There is also a vote of $32,500 for telephone line extensions.

Ice-Breaker Launched. — The icebreaker "J. D. Hazen," built by Canadian Vickers to the order of the Dominion Government for service on the Lower St. Lawrence, was successfully launched on Monday afternoon, May 15. Lady Borden, wife of Canada's Prime Minister, performed the christening ceremony.

Canadian Lumbermen for England.—Fifteen hundred Canadian lumbermen have gone to England to cut timber for railway ties, pit props, and other purposes and within a few weeks an important result is expected from this experiment in saving the import of foreign timber with its attendant demand on tonnage.

Cobourg, Ont.—It is stated that the steamer Caspian, formerly on the route between Charlotte and the Bay of Quinte, has been withdrawn. The Bay route to Charlotte has long been in use and, if abandoned, will mean that travellers will have to cross the lake at either Kingston or Cobourg. This route was a feature of the Gildersleeve Lines for more than thirty years.

Insurance Against Peace Declaration.—London underwriters on May 23 charged 50 per cent. to insure against a declaration of peace between Great Britain and Germany before January 1. The rate indicates that in the underwriters' opinion the prospects for an early peace are better than two months ago, when the rate for the same risk was only 30 per cent.

Docks for Point Edward.—Grand Trunk engineers have been in the city for the purpose of taking depths of water in the river at Point Edward, where the company is to build a 1,000-foot dock and freight shed for the Port Huron & Duluth Steamship Line. These boats formerly landed in Port Huron, but the sheds there were destroyed, and Point Edward was picked as a better location for the new sheds.

Port Arthur, Ont.—Reports from Port Arthur state that the Western Drydock & Shipbuilding Co. has received a con-

tract for the construction of fifty motor boats for the British Government. Five carloads of steel recently arrived at Port Arthur to be used in the construction of two freighters, the contract for the construction of which was received by the company a short time ago. The Russian Government is also reported as placing a contract for the construction of six icebreakers, three of which will be built at the head of the lakes.

Quebec Pilots and Apprentices.—A bill has been introduced in the House of Commons, amending the Canada Canada Shipping Act as regards pilots and pilot apprentices in the Quebec Pilotage District, and providing that the number of pilots for that district shall not exceed 125, and that when the apprenticeship period of a pilot has been interrupted by sickness or other legitimate cause, he may be allowed to serve an additional period equal to the time lost, and if found otherwise qualified and entitled to a license, he may be granted such license after he has completed a full service period of seven years including the additional period.

Mercantile Losses in February. — The Bureau Veritas has published statistics concerning losses to the various mercantile marines during February on account of the war: During the month 47 ships of a total tonnage of 105,232 were lost. The loss of 26 ships of a total tonnage of 56,345 tons was due to submarines or mines, 9 ships of 16,165 tons to auxiliary cruisers, and one of 957 tons to a Zeppelin. England has been the greatest loser, 27 of her ships of a total tonnage of 58,000 tons having been destroyed. Other nations lost ships as follows:—France, 7 of 25,000 tons; Belgium, 4 of 6,710 tons; Russia, 2 of 4,108 tons, and neutrals, 7 of 10,000 tons.

To Restrict Sealing.—As a direct result of one of the most successful seal-hunting seasons on record, the Newfoundland Legislature has enacted restrictions designed to prevent the extermination of the animals in the waters about the Island. Large steel steamers, such as have been used extensively during the last few years, are now prohibited from engaging in sealing. Most of these vessels were sold to the Russian Admiralty last year for use as ice-breakers, but one, the Florizel, has brought in 46,000 pelts, the largest number ever secured by a single ship, and yielding a profit of $130,000. The new restrictions will make it impossible to use a vessel capable of carrying more than 25,000 pelts. The total catch for this season was 295,000 seals, valued at $650,000.

Lloyds' Registry Appointment.—The Committee of Lloyds' Register have appointed James French, principal surveyor at Glasgow, to the position of prin-

cipal surveyor for the United States and Canada, with his headquarters at New York. Mr. French, who served for a considerable time previously on the American staff of the Register, has already undertaken his new duties. He was among those present at the launch of the new ice-breaker, "J. D. Hazen."

Japanese Business Booming.—Industry in Japan is booming as a result of the war, an dthe enterprising among the citizens are securing a considerable portion of the business formerly done by the German and other merchants and manufactnrers. As the Japanese know how to hold on to a thing when they get it, it is to be taken for granted that they will relinquish little if any of their newly-won trade after peace is declared.

Catalogues

Waugh Glazing Construction is the title of a Bulletin No. 56 describing the product of the Asbestos Protected Metal Co., Pittsburgh, Pa. The distinguishing features of this system of construction are dealt with fully, and are further explained by means of a series of detail drawings. A number of excellent half tones show various classes of building where the "Waugh" glazing has been installed.

Grinders.—The Challenge Machine Co., Philadelphia, Pa., hase issued a bulletin illustrating and describing the "Challenge" grinders. Sixteen of the various combinations of these grinders and several units are shown accompanied by a description covering their principle features. Tables are included giving dimensions for the various sizes of grinders, also dimensions of columns and countershafts.

Notes on Screw Gauges.—The National Physical Laboratory has published some "Notes on Screw Gauges," giving the results of experience in testing same. It is written by the staff of the Laboratory, and deals particularly with some of the difficulties which occur in manufacture and testing. Simple methods of measuring the principal elements of the gauge are described, and the need for making some of these measurements during manufacture, are explained. Many subjects are dealt with, these including: The need for accuracy in a Gauge; Verification of Screw Gauges; Errors of Screws; Measurement of the Diameters of Plug Screws; Notes on Tools; Measurements of Ring Screw Gauges; Measurements at the Lathe; Pitch error; Measurement of Angle of Plug Screws; Measurements of Effective Diameter; also Angle of Cylinders of other than "best" diameters, data for measurements.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, JUNE 1, 1916 No. 22

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 22 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Interesting Type of Canadian Built Oil-Driven Tractor

Staff Article

The internal combustion engine possesses certain features, such as ease of fuel supply, small consumption of water, portability and safety of operation which render it peculiarly adapted as a prime mover for agricultural machinery. Not only in this country does the convenience of liquid fuel give this type of engine a marked advantage over steam, etc., but in nearly all the principal grain-growing countries of the world similar conditions obtain.

AN important factor in the development of the agricultural resources of the various grain growing countries has been the ever-increasing adoption of mechanical power not only for cultivation of the soil but for the performance of much work which has hitherto demanded arduous physical labor when done by hand, or has involved the use of animal power, both of which sources are less efficient, more strictly limited in output, and in the case of the former are sometimes completely unobtainable. Under these circumstances the development in this country of power generating apparatus specially adapted to the conditions outlined has been of steady and consistent growth.

Mechanical Power Favored

The phenomenal development of motor cars and their adoption by people in every line of business has so thoroughly familiarized every power used with the principles of construction and details of operation of internal combustion engines, that the use of motor driven agricultural machinery, factory power plants, domestic apparatus, and municipal equipment has developed to such an extent and the benefits so fully recognised, that physical labor is rated at its true worth and discarded in favor of mechanical power wherever possible.

For the past fifteen years, the Goold, Shapley Muir Co., Brantford, Ont., have devoted a large part of their energies to the production of internal combustion engines using gas, gasoline and oil as fuel, and have developed various types of engines capable of efficiently performing all the various duties required of such machines as may arise in the course of work, be it a farm tractor cultivating acres of ground daily, a small inconspicuous engine driving water pumps of all descriptions, grain grinders, saws, cream separators, etc. or a carefully tended high powered engine of special design supplying power to electric light plants, planing mills and factories of all kinds.

A moderate powered engine, typical of the general design of horizontal unit built by this firm is illustrated in Fig. 1, which shows the exhaust side of a hopper cooled engine the combination of the cooling water tank, with the cylinder casting being a feature which possesses many advantages where portability is desired. The engine is shown mounted on skids which facilitate its transportation when occasion arises, although when the full degree of portability is desired these engines are mounted on steel frame work on wheels.

Single cylinder engines in eleven sizes up to 25 horse-power and double cylinder engines of opposed type, in seven sizes from 18 horse-power to 60 horse-power are built with various methods of water cooling.

Farm Fractors

Tractors for farm use are built in two sizes 35 and 50 horse-power, the opposed type of engine being well adapted for this class of work. A view of the right side of the larger machine is given in Fig. 2 and a view in course of assembly is shown on Fig. 3, the arrangement of the principal members being clearly shown. The

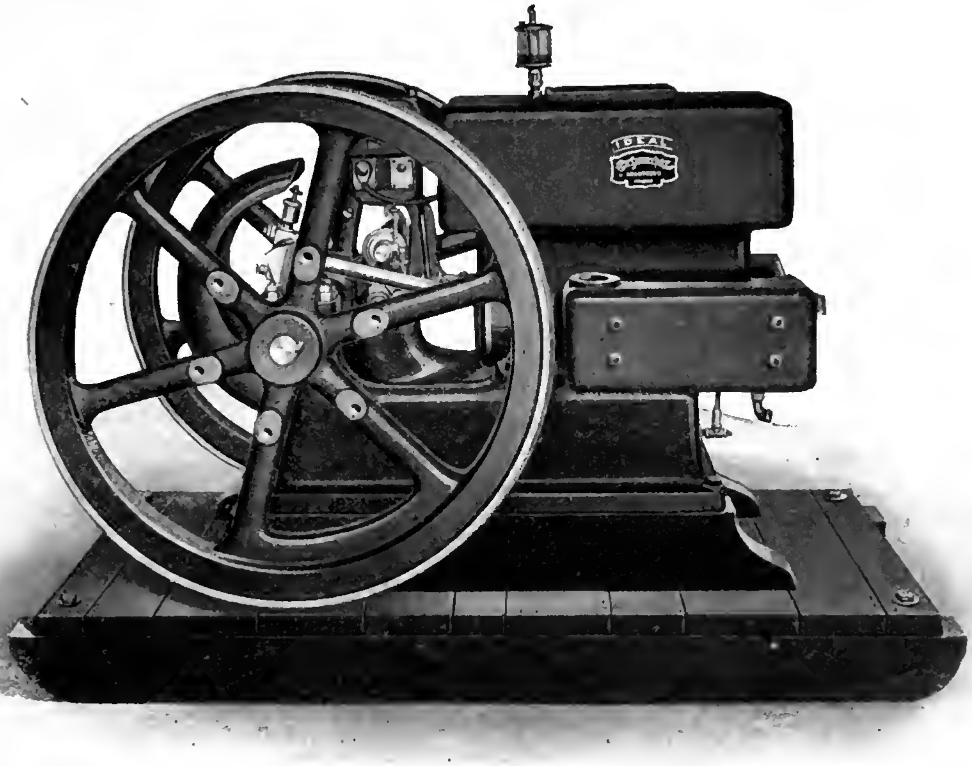


FIG. 1—EXHAUST SIDE OF HOPPER COOLED ENGINE MOUNTED ON SKIDS FOR TRANSPORTATION.

main frame is formed of two heavy steel channels to which the engine is fastened, the width of the frame at the front allowing of ample steering

FIG. 2. RIGHT SIDE OF 30 HORSE-POWER TRACTOR SHOWING THRESHING PULLEY WITH SELF-CONTAINED CLUTCH GEAR.

lock to the front wheels, while the rear end of the frame is widened out to form a support for the driving platform.

Two forward speeds are provided, a road speed of 4 miles per hour, and a plowing speed of 2 miles per hour with similar reverse. The forward and reverse speeds are obtained by the movement of a single lever seen projecting above the driving platform in Fig. 2. The lower end of this is coupled to a vertical shaft just in front of the clutch pulley, which by means of a cam plate as shown in Fig. 5 operates either of a pair of band clutches to give the desired direction of travel. The two views in Fig. 4, show the clutch details, the principal parts being the engine shaft A which carries the assembly—driving pinion B keyed to shaft A— planetary pinions C mounted on reverse clutch D and forward clutch E which carries an internal gear F, meshing with the planetary pinions, an outer rim G for driving by belt, and a double gear H mounted on the hub extension formed integral with E.

Action of Clutch

Assuming the shaft to be revolving toward the reader, the action of the gearing will be understood by supposing both clutch bands to be slackened. Driving pinion B will cause the planetary pinions to revolve on their shafts so that along with the reverse clutch D, they will move in the same direction as the engine shaft, but without imparting motion to any other parts. The forward clutch band however, is tightened by means of a lever I which is mounted on the reverse clutch, and is operated by a spool sliding on the hub of reverse clutch D, and when this is done, the result is to lock both clutches together so that the pinions cannot move in relation to the internal gear and consequently the entire assembly is driven round by driving pinion B in contact with the three planetary pinions. When the forward clutch band is released and the reverse band tightened, the latter, being anchored to the engine bed, prevents the planetary pinions from traveling around with driving pinion B, which accordingly drives the planetary pinions in a reverse direction and through them the internal gear F with its rim and double gear. The double gear is used to obtain the two speeds by sliding it along the shaft as shown by dotted lines, the difference in diameter being compensated for by an idler gear on a swinging arm which is raised to mesh with either gear after changing speeds. This arm and idler gear can be observed in Fig. 3, being located immediately below the clutch pulley; the idler meshes constantly with the large spur gear in the centre of which the differential mechanism is assembled.

Differential Gear

The differential bevel pinions are fitted with grease cups supplying lubricant direct to points of greatest pressure. The heavy spur pinion on the outside of the differential gear meshes with the internal gear mounted on the side of

FIG. 3. TRACTOR IN COURSE OF ERECTION, SHOWING SUBSTANTIAL CONSTRUCTION OF REAR AXLE DRIVING MECHANISM.

the large road wheels, see Fig. 2. The rear axle is formed of solid steel shafting strongly reinforced by steel castings built into the frame at this point, the driving wheel being assembled on the projecting portion of the shaft shown in Fig. 3.

An outline drawing of the engine and clutch is reproduced in Fig. 5, while details of carbureter and steering gear are given in Fig. 6 and 7. Fig. 8 and 9 show left side and back view respectively of the complete tractor.

The carbureters of which there is one to each cylinder are adapted for the use of kerosene and give satisfactory results in use. The bowl below the atomising tube is jacketed with hot water from the cylinder, the flow of fuel being regulated by the needle valve from the outside, the venturi tube type of passage responding to variations in demand as affected by the butterfly throttle valve which is operated from the engine governor. An automatic injection valve controls a supply of water to the carbureters for use in the cylinders

The engine is fitted with jump spark ignition of a type which gives as full spark when turned over slowly as when running at speed, thus facilitating starting.

Steering Gear

An underneath view of the frame is given in Fig. 7, the flexibility of the front axle being well shown. The operator controls the steering from a vertical hand wheel through worm and gear to the pinion located between the two racks in Fig. 7. These racks are slidably mounted in a guide plate and as they both mesh with the pinion, they travel in opposite directions when the pinion is revolved, thus causing the front wheels to assume the desired position when turning to either side.

The front axle is of strong bar construction the rear member being extended backward where it is supported in a pivot bearing in line with the front bearing. Free movement of the axle is thus assured under the worst of

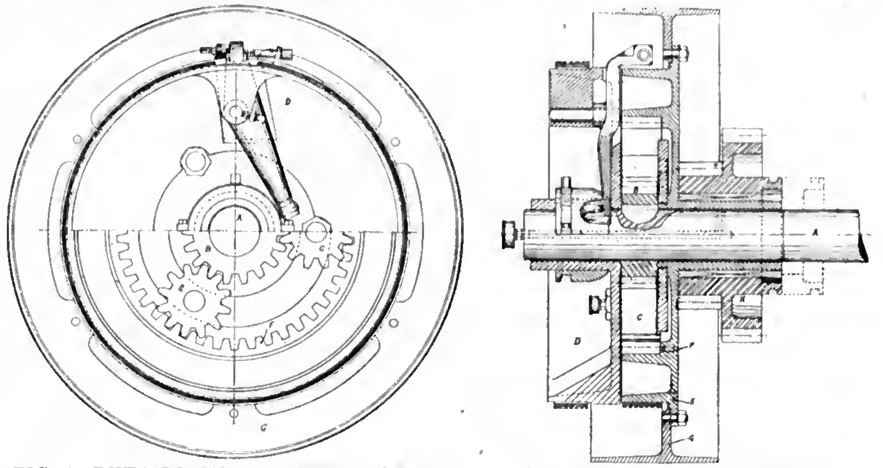


FIG. 4—DETAILS OF TWO SPEED GEAR AND REVERSE CLUTCH MECHANISM.

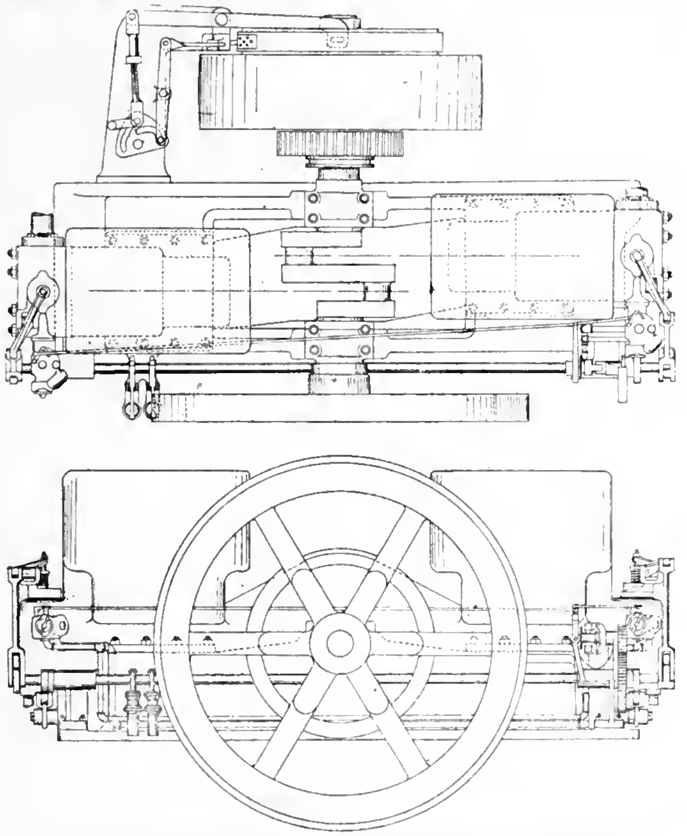


FIG. 5—ELEVATION AND PLAN OF DOUBLE-OPPOSED ENGINE SHOW ARRANGEMENT OF CLUTCH OPERATING GEAR.

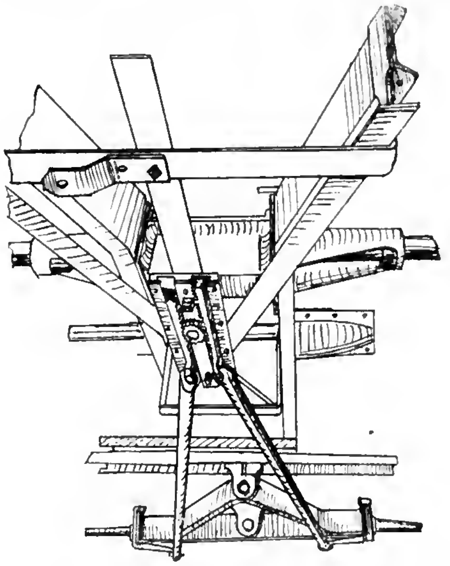


FIG. 7.—ARRANGEMENT OF STEERING GEAR.

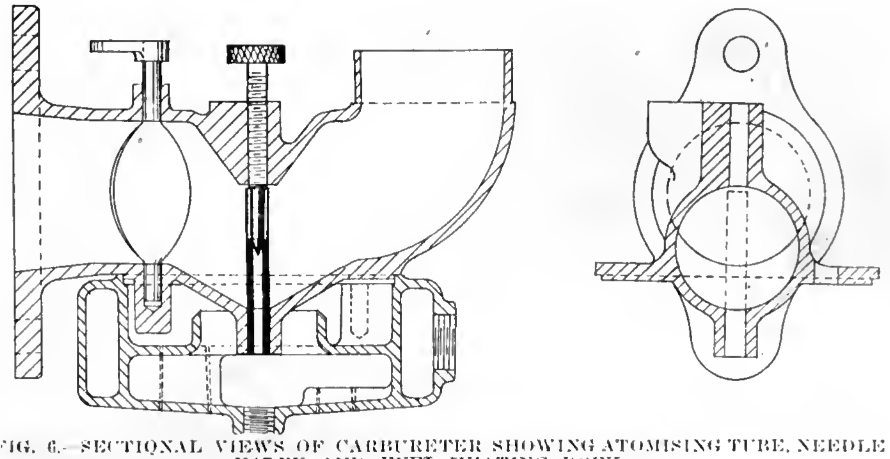


FIG. 6.—SECTIONAL VIEWS OF CARBURETER SHOWING ATOMISING TUBE, NEEDLE VALVE AND FUEL HEATING BOWL

road conditions without causing undue stress in the engine, or frame. Corrugated ground locks are mounted on the driving wheels, providing ample grip in

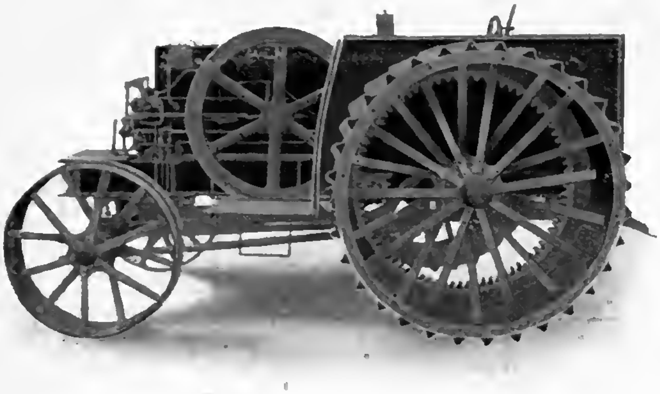


FIG. 8—LEFT SIDE OF TRACTOR.

heavy going and avoiding cutting of the sod. Both front and rear wheels are of riveted steel plate and bar construction. Bronze bearings are used throughout and steel castings for the transmission gears.

Contractors' Plant

The adaptability of small power internal combustion engines to the performance of much work previously done by hand is particularly marked in the case of contractors' machinery, of which concrete mixers, hoisting machinery, pumps, stone breakers, etc., are familiar examples. The production of such machinery provides a considerable demand for motive power, and in the case of the firm in question maintains a balance of activity in the smith shops and running gear departments, which are necessary for tractor building. Figs. 10 and 11 show two views of a concrete mixer driven by a $2\frac{1}{2}$ horse-power vertical engine, the outfit being designed to meet the requirements of contractors on small jobs. The entire construction is of steel, the truck frame being 7 ft. 8 in. long, with a clearance of 19 in. above ground,

FIG. 9. REAR END OF TRACTOR.

and a tread of 4 ft. 2 in. Steel wheels, with 3 in. wide tires, are fitted to built-up axles of channel steel.

The mixing drum is 36 in. dia. by 26 in. wide, and is encircled by a 3 in. wide gear ring, which revolves the drum on four rollers.

Capacity

The capacity of the mixer is a 4ft. or $\frac{1}{2}$-bag batch, fifty yards being easily mixed in ten hours. The drive to the drum pinion is through a positive clutch, which is provided with a friction device for taking up the drive before engaging positively.

A tilting chute is arranged on the discharge side of the mixer, and when not in use, this points downwards into the mixer enabling water to be conveniently introduced. When discharging, the chute is tilted towards the outside, as shown in Fig. 11, the mixture being deposited on its inner end as the blades carry it around, and thence falling down the chute which is of a convenient height for discharging into wheelbarrows. The engine is protected by a steel housing, not shown in the cuts, and the complete outfit with tongue for team weighs 2,200 lbs.

BRITISH BUILT MACHINERY

IN a recent report on the trade of Finland, the British Consul, comparing the respective merits of German and British machinery, said that German goods had very much improved in quality during the last few years, and in many branches were beginning to compare favorably with British goods, especially as regards machinery.

British machinery seemed to be almost too strongly made, and was practically never worn out. The Germans, on the other hand, appear to aim at making machines which would last a certain number of years, and work out the exact structural strength required accordingly, one result being that their machinery could be sold at a good profit, though at a cheaper price than the British article. As an instance in point it was stated that a firm in Finland recently bought two steam engines, one of British and the other of German make. Both worked very well. The German engine was, however, much more economical, of modern design, good workmanship and lower in price.

The British machine would probably last longer, but would become more and

FIG. 11. DISCHARGE SIDE OF CONCRETE MIXER SHOWING TILTING CHUTE.

more out of date compared with new designs put upon the market every year. On the other hand, when the German machine was ready to be scrapped, it was reckoned that money would be saved by buying a new engine embodying improvements which experience had in the meantime suggested.

BRITAIN AND ENEMY-SEIZED SHIPS

A NET gain of $24,250,000 has been realized by Great Britain from their seizure of enemy ships and their cargoes in the last twenty months of the war, according to the record of the Prize Court. The Government has captured 157 ships, which have been disposed of after decision by the prize court as follows:

	No.	Tonnage.
Sold	42	54,772
Requisitioned	42	56,162
Detained till after the war and requisitioned	73	85,036
Total	157	195,970

The results of the sales have been approximately: Proceeds of condemned vessels and interests, $1,674,025; expenses of sale, $26,540; total proceeds of

FIG. 10. LOADING SIDE OF CONCRETE MIXER SHOWING BELT DRIVE AND CHARGING HOPPER.

sale of ships and cargoes, $24,250,000. There are many more vessels and a large quantity of cargo still before the Court.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

ECONOMIES IN SHOP MANAGEMENT

By H. Womersley.

JUST as we possess "fixed opinions," "set notions," etc., regarding the greater problems of life, so we possess a multitude of set notions regarding the best form of machinery and best methods of conducting a manufacturing business. Many of these notions have been acquired without careful thought. They have just been absorbed from our experience and environment. In some cases we may have assumed that someone has previously given the matter proper consideration, and that the existing conditions are the result of their conclusions. As a matter of fact, many of the conditions now existing in the machine shop are the result of allowing old practices to continue after conditions have changed, and this has taken place without the attention of anyone.

There is no desire to belittle the opinions of others; in fact, we must depend on others for most of our opinions; but there are so many things that have been left to "others," apparently by everybody, that it is well for us to do some independent thinking, especially on our own immediate problem, and cast a glance at least at some of our notions, just to see if they bear proof of having been thoughtfully produced, or unthinkingly allowed to take form. For years engineers have concentrated energies on the steam engine of the reciprocating type. The master minds have made important improvements in the design, and many have given up their entire existence to the science of analysing the effects of each variation in conditions of working the steam. Our text-books, our teaching, our observation, all concentrated our attention on this type.

Opportune Application

For some reason Gustav De Laval and C. A. Parsons broke away from this spell, and now we have the steam turbine engine. These two individuals are endowed with master minds, but the task of producing the turbines was probably no greater than the task of others in improving the reciprocating type. In one case a great step has been taken; in the other, we have an example of men of undoubted ability laboring hard for entire lifetimes with relatively small gain. This example applies to more than the inventors' world. It has many parallels in the cold businesss management of a manufactory or one of its departments. Business management requires the same kind of reasoning and getting away from the spell of environment.

The best plant of management cannot be obtained from history. The vast store of data of correct practice of former times will not serve the purpose. A record of the practice of even the last decade is inadequate, for rules of the game are continually changing.

The investment in a machine building plant and business is not wholly protected by fire proof buildings and ultra conservative management. The security must be protected by conducting the business on profitable lines. Safeguarding the money tied up in machinery equipment and buildings is important but should not lessen the consideration of elements which have to do with the expense of operating. A plant and business is useless when not in motion, and when under headway requires money. Money must be poured into it steadily. The amount every year generally equals the total capital in the business. Money invested in plant is not very safe if there is a tendency to squander the energies over too many problems.

Variety Product Handicap

The manufacture of a great variety of articles in response to a demand by the selling organization of a company is a relic of other days. Our notions about methods for selling must be changed over to fit the modern scheme. They must be kept up-to-date. The survival of the fittest will eliminate all, except ing specialists or groups of specialists.

The entire cost of conducting a business may be lowered by simply continuing along with the same men. This applies to the entire organization from the workmen to the salesmen. Changes should be made to keep up a wholesome spirit of progress. Men should be advanced from position to position as the opportunities afford and their endowments allow. Others unfortunately must be dropped out from the organization; but both the advancements and the weeding out must be carefully considered.

The management's chief business should be to take men as they are found on earth; mould as much as possible, and place each one where he will accomplish the best results for both the organization and the individual.. Barring the disgruntled, the uncongenial and the habitually inattentive, almost all men may be and should be profitably employed, the prime requisite being reasonably close attention to business. The thoughts must not habitually wander away from the work.

The management does not "manage" if it perpetually changes its men. It should bolster up the men who lack self confidence; it should puncture false ambitions, and it should use men as they are found in the organization. It should not be inclined to "go back on" a man who has blundered or who has been found lacking in understanding. It should not be over ready to embrace a stranger just because his faults are not known.

All business is pushed forward by men who have confidence in the project and in the product. If these men lose their faith in their own business, they not only lose their usefulness as pushers and managers, but they become drags on the industry, and remain so until restored to normality.

Suppositious Knowledge

The designer may have had almost complete knowledge regarding the best way to make each part, just how each fit should be made, and just how the machine should be operated under each combination of conditions, but it is more probable that the designer never had all this wonderful knowledge. If he knew all this, it would be of value providing he had some perfect way of imparting his knowledge to each individeual worker. We know, however, that this is impossible, even with the most thoroughly organized companies. It takes years to get each piece made as it should be made, even with no change of design, and this is not accomplished by any other process than continual practice, which is only acquired by making these pieces. The quality and speed of production increase with this experience and are not acquired without it.

A Rational Policy

The art of assembling and operation of the machine is developed in the same way. There are other means that facilitate, but nothing that takes the place of practice. The knowledge of the machine must be not only in the designer's head; it is not even enough to have it thoroughly known by all officers, including foremen. It must be patiently transmitter to the real workers.

One of the most satisfactory policies of management is that which tends toward getting the best return or profit per dollar of investment. The best scheme of management for profit is one that puts the capital where it will do

most good. One of the most common errors in this respect is the one that regards the reduction of labor costs as the paramount consideration. Reduction in labor cost has been the war-cry. The labor bill has been talked about so much that it has seemed to be the whole thing. What is the gain if the means for reduction of the net labor cost reduces the profit more than the saving in labor? If doing so results in an actual loss of profit, why is it done?

The cost of the product of the average plant may be divided into three nearly equal parts: the material, the labor and the burden: or, in four equal parts, if a reasonable interest charge is made for the use of the capital invested. The material is the iron, steel and other material that enters into the construction of the machine, and it is taken in the condition in which it usually comes to the machine shop. The burden includes all expenses and salaries necessary for the maintenance of the business. About one-half the amount paid for labor goes to the men who run the machine tools. Therefore the cost of labor is either one-sixth or one eighth of the total cost. On top of the net cost of the product there should be a profit. If it is not there, the sooner something happens the better. If it is there, then it is proportioned to the volume of the output. Therefore, both the size of the output and the labor cost should be kept in mind.

Stock Turnover

The dividing line between excessive and insufficient stock must be drawn in each individual case. An excessive stock of this or that piece, or of all pieces, means that much capital is idle, and it also tends to slackness of management. Frequently it is the outcome of carelessness. If money is to be retained in the business, it should be put into changing over the system to one which will conform to the plan of putting the money where it will bring the best return. The excessive stock in process is an outcome of blind progressiveness—the blindness that fails to see that there is as much money tied up in stock in process and in finished product as there is in the entire machinery equipment.

An adaptable equipment facilitates keeping down the amount tied up in stock in process. The modern plant should take advantage of these modern methods and machines which tend toward profitable use of capital. Such machines are highly developed and true to the controlling ideal of adaptability and largest output per dollar of investment.

CONCERNING ANTIMONY

ANTIMONY sulphide has long been in use by the Chinese as a coloring matter in the manufacture of pottery and in the ceramic arts. It is also largely used in making anti-friction matches, which contain about 25 per cent. on the match and 55 per cent. in the smear on the box.

Antimony is also extensively used for printing type and for anti-friction metal and bearing metals. English type metal is an alloy of antimony, lead and tin. Britannia metal consists of tin, antimony and zinc. Pewter contains tin, antimony, copper and bismuth, and anti-friction metal is usually composed of copper, antimony and tin. Antimony is employed in the manufacture of paints and colors.

Antimony white has recently come to be employed in the manufacture of enamel for household utensils, bathtubs, etc. Japan imports large quantities of antimony from China, which is manufactured into numerous artistic articles of daily use, glove and cigarette boxes, the backs of hand-mirrors and hair brushes, cigarette and card cases, statuary, ornaments, etc. Recently the value and need of antimony in the manufacture of explosives has become well known.

STEEL AND MALLEABLE IRON CASTINGS

THE choice between steel and malleable iron castings is dictated by their respective properties, partly by price, and partly by the limitations of the processes by which malleable iron is made. As pointed out in a paper read before the International Engineering Congress, steel is, in its nature, a more homogeneous metal, and, therefore, tougher and stronger than malleable iron. Moreover, castings of malleable iron are somewhat prone to actual porosity or sponginess at the centre, especially in certain portions of irregular castings, so that for this reason also a steel casting is stronger and more reliable. Finally, malleable iron can be made only into castings of quite light sections, whereas there is almost no limit to the size and weight of steel castings that can be produced. For uses where only a fair amount of strength and toughness is necessary, the castings being therefore of light section, it often pays to have them malleable, because they are cheaper than steel.

PIECEWORK SYSTEMS—III.

By R. R. Clarke.

BEFORE concluding this series of articles, I cannot refrain from submitting a few remarks on the premises from which an equitable piece-price is derived, and we throw our sincere belief in the spotlight when we assert that none except a man thoroughly acquainted with the ins and outs and closest details of the trade along with that of the local equipment is competent to pre-judge the worth of any piece of work to the doing of which that trade applies. We are not a foe to the efficiency expert or his aim, though in all candor we deplore many methods complementary to his system. We firmly believe in a test but we believe as firmly that the stop-watch man never made a fair one, neither to the man or the firm in whose interests he operated. To the realization of such the confidence and co-operation of human nature is absolutely essential, and that time the stop watch has never ticked nor can it ever. Our idea of a fair test differs from that of a man who watches a man 10 minutes, stops his watch, counts the output, multiplies by 60 and divides the product into 300 cents to arrive at a fair piece-price, and we are satisfied that the great underlying principles of human nature, troubled and resentful thereto, establish the justice of our differing opinion.

Determining a Fair Price

We remember a test to the supervision of which we were once assigned. The object was to derive a fair price on an improved machine connected with foundry production. The idea pre-conceived by the manager was that the machine was at least a 50 per cent. all around improvement over the one it displaced. The figure capacity of the old machine was 300. Giving the workman ample time to become thoroughly acquainted with the new machine, a test was decided on. The evening before the day chosen, I examined the machine and found it in good order. On the morning of the day's test I walked over to the machine shortly before 7 a.m., called the workman to one side, and told him that the object of the day's work was to make a fair test of the reasonable capacity of the machine, that a piece adjustment would follow, that in making the test I expected no breakneck speed, and at the same time would tolerate no unreasonable delays. I closed this preamble by expressing the hope that there would be no occasion for recurring to the subject and the test was on.

The output desired was 600. At noon the 400 mark was passed, one o'clock showed the spirit neither lacking nor lagging, and at 3 p.m. the work was done. If ever a workman practically volunteered the best that was in him, that fellow did and why? Because the "open and above board," "strictly on the square principle" appeals to human nature and brings out the best that is in it.

The aforementioned constitute the underlying principles on which most foundry piece-work systems are constructed and can be applied to the advantage of all. Fair prices, courteous firmness, just consideration and a sincere desire for mutual advantage will open the way to the system's efficiency.

Simcoe, Ont.—Fire destroyed Chrysler" barrel head and saw-mill at Windham Centre on May 27.

Niagara Falls Power: Its Importance as an Industrial Factor *

By F. J. Tone **

In twenty years, the electric furnace has rendered possible an industrial advance rivalling the progress of the preceding two hundred years. The almost magical properties possessed by electric products are only equalled by their variety and number, while their industrial value is amply demonstrated by their ability to reduce costs of other materials and products.

THE development of Niagara power in 1895, only 20 years ago, marks the beginning of the electric furnace art. It stands to-day as one of the big factors in our industrial life. Up to 1895, when Charles M. Hall came to Niagara, the aluminum industry depending on steam power had given little promise of commercial success. Its almost incredible development during 20 years has been due to the impetus of Niagara power, and its future magnitude no one dares to predict. Dr. E. G. Acheson with a 150-h.p. furnace operated by electric power generated from steam had made a commercial failure of carborundum. Coming to Niagara in 1895, he was at once enabled to found the artificial abrasive industry. Willson, the inventor of calcium carbide, was working at Spray, N.C., with a 200-h.p. furnace. To-day we have 12,000 to 15,000-h.p. furnaces making almost as much carbide in one day as the former furnace produced in a year.

With the technology of these great industries, aluminum, calcium carbide, cyanamid, abrasives, ferroalloys, silicon and graphite we are all familiar, but few realize their economic importance or to what an extent the industrial and metallurgical arts are indebted to Niagara power for their development, especially at this time, when we are taking stock of our industrial assets and determining how the nation can best make itself industrially self-contained.

Ferrosilicon

The manufacture of steel is the greatest of all American industries, and its dependence on Niagara power is strikingly illustrated by a study of the ferroalloy industry. In 1915 the estimated production of finished steel in the United States was 28,000,000 tons, and in a major portion of this there was employed as the chief deoxidizing agent high-grade electrically produced ferrosilicon. This alloy is used in practically all steel manufactured by the basic open-hearth process, which in recent years has so far supplanted the Bessemer process as to account for more than 70 per cent. of the total production. To a lesser extent electrically produced ferrosilicon is used in almost all the other processes of steel manufacturing.

The steel-casting industry finds high-grade ferrosilicon practically indispensable for eliminating blow-holes and producing sound castings. The cast-iron foundry industry has in recent years realized the advantages of the use of this alloy, and progressive establishments now depend on it for a control of their castings.

Niagara Falls is the home of ferrosilicon in the United States, and up to the present time the total domestic production has been made from Niagara power. For a short time prior to the European war some ferrosilicon was imported, but a large portion of this was produced by Niagara Falls power in Canada. The Canadian producer has, since the war began, been compelled by Government order to export ferrosilicon to countries other than the United States, thus increasing an existing unprecedented demand for the domestic product and causing a power famine on the American side of the Niagara River.

This fact has a significant bearing, not only on the inadequacy of the total supply of Niagara Falls power, but on the regulations which govern the importation of electrical energy into the United States. A cessation of the supply of ferrosilicon would be nothing short of a calamity to the steel business, and when we further consider that specifications for shell steel for munition purposes call for 0.20 to 0.30 per cent. silicon, we see the role ferrosilicon plays in munition manufacture and the realization of our own programme of preparedness.

Ferrochromium

The essential element in the manufacture of successful armor-plate and armor-piercing projectiles is introduced into steel by ferrochromium. Without this alloy not a battleship could be provided with protective armor, nor a coast defence gun served with modern projectiles. More than one-half of that now consumed in the United States is produced at Niagara Falls. Ferrochromium likewise enters into the manufacture of automobile steels, steels for jaws, balls, linings of crushing machinery, dies and a variety of special steels.

Sir Robert Hadfield has compared the striking energy of an armor-piercing projectile with that of a modern express train. He states that a 14-in. (35 cm.) projectile weighing 0.62 ton and fired so as to pierce 12-in. (30 cm.) armor plate at a distance of eight miles (13 km.) must have a striking energy of 30,000 foot tons (9,000 m. tons) and a striking velocity of 1,700 ft. (510 m.) per second, or twice the energy of a modern express train running at 40 miles (67 km.) per hour. The shell has 1/8000 the bulk of the train, and the metallurgist has been able to provide a shell having a steel point of such quality that it delivers this concentrated energy upon the hard-faced plate and passes through it without suffering deformation. This is a striking metallurgical achievement, but it is the electric furnace and ferrochromium that have made it possible.

Tungsten-Vanadium-Molybdenum

These alloys are made in part from Niagara power, and when made elsewhere there is largely used as a reducing agent metallic aluminum, also a Niagara product. They form the chief constituents of a relatively high-priced group of products representing an annual production of several millions of dollars, and which in conjunction with chromium are absolutely necessary in the manufacture of high-speed tool-steel, magnet-steel, certain gun-steels, and a variety of special steels. High-speed steel furnishes a most striking example of the dependence of the metal-cutting industries on products of Niagara power. To one familiar with machine-shop practice under the limitations of carbon steel, where it was necessary to maintain a cool cutting edge, it is amazing to see a 17-in. (43 cm.) forged shaft destined for some battleship revolving at a surface speed of 30 ft. (9 m.) per minute, the tool of high-speed steel working at red heat, and chips 1½ in. (4 cm.) wide and ⅝ in. (1.4 cm.) thick coming off, colored a deep blue. Ferrochrome and the other alloys of this group have made this possible. High-speed steel has tripled the capacity of every machine shop in the world and the efficiency of every workman. It has cut to one-third the capital invested in tools to accomplish a given volume of work.

Considering the metals or alloys of chromium, tungsten, vanadium and molybdenum as a group, it may be positively stated that in the absence of these products we should not be in a position to build modern battleships, guns, submarines and many other machines necessary for the nation's defence, to proceed with thousands of operations involving the cutting of metals at a rate comparable with the present or necessary to

*From a paper read before the spring meeting of the American Electro-Chemical Society at Washington, D.C.

**Works Manager, Carborundum Co., Niagara Falls, N.Y.

successfully meet foreign competition. A goodly proportion of our steel and metal working industries, mining operations and scores of other industries would find themselves in the condition of practically twenty years ago.

Ferrotitanium and Silicon Metal

Titanium, as a ferrocarbon-titanium alloy, is employed in a large tonnage of steel made by the Bessemer and open-hearth processes, as well as in the production of steel and iron castings. The aluminum bronze and other nonferrous alloy industries are being greatly benefited by the use of titanium alloys.

A special steel of great importance to electrical industry is silicon steel, used in electrical transformer construction and all alternating-current apparatus. Silicon metal and 75 per cent. ferro-silicon essential in its manufacture are produced only at Niagara Falls. The ageing of transformer steel has long been the cause of a serious falling off in efficiency. This loss often doubled after a few years' use. Silicon steel does not age. Moreover, its original hysteresis loss is 25 per cent. less than that of the old type of steel. The saving in a large generating and distributing system from the generator through step-up and step-down transformers to the motor may be as high as 6 per cent. Thus silicon steel, a comparatively unknown product, is saving many millions of dollars annually wherever electric energy is transformed.

Silicon metal as a "preparedness" product is important in the generation of hydrogen for aeronautical purposes. In conjunction with caustic soda it forms the cheapest method of generating hydrogen in the field or on shipboard when portable outfits are required.

Aluminum and Abrasives

The manufacture of aluminum is the largest of the electro-chemical industries in point of power consumed and value of product. Commercial development was made possible by Niagara power, and Niagara Falls was for many years the only seat of the industry. Even with the prodigious increase in production the scarcity of aluminum is to-day very acute and is regarded by automobile engineers as little less than a calamity.

The electric furnace abrasives, carborundum and alundum, are fundamental elements in the metal-working industries. They have revolutionized the methods of finishing machine parts, just as high-speed steel has revolutionized the art of shaping metals by cutting. Artificial abrasives have been gradually displacing natural emery and corundum, until in 1914 they constituted 62 per cent. of the total abrasives used in the United States. The natural abrasives have practically all been imported, and comprise Turkish and Grecian emery. With the beginning of the war mining in Greece and Turkey ceased, and artificial abrasives have been called on to supply the whole field. There are five plants making artificial abrasives from Niagara power, three of which are on the American and two on the Canadian side of the river.

The great metal-making industries making agricultural implements, locomotives, cash registers, electrical machinery, firearms, flour-milling machinery, paper machines, automobiles and all castings of steel, iron and brass are entirely dependent to-day for an adequate supply of grinding materials on Niagara power. As a simple example, take the automobile industry. The mechanical perfection of the modern automobile and the interchangeability of parts have been made possible only by the development of the grinding machine and the grinding wheel.

Cut off the artificial abrasives and force the automobile manufacturer to go back to the grindstone, at the same time eliminating the other products of Niagara power, aluminum, high-speed steel and special steels, and we would see a works which now produces 500 cars per day reduced to an output of considerably less than 100 cars, with the same force of workmen and the same plant equipment. This would mean such an increase in price that there would be no automobile industry on its present existing lines.

Manganese steel, one of the unique materials of engineering, was little known fifteen years ago. To-day the output in frogs and switches, burglar-proof safes, dredges, gears and rolls represents many millions of dollars. No steel tool will cut it. Without grinding wheels to shape and fashion manganese steel it would still be a metallurgical curiosity.

Calcium Carbide and Artificial Graphite

This electric furnace product is the only commercial source of acetylene, important in its application to the oxy-acetylene cutting and welding of metals. A cessation in the domestic production of calcium carbide would entail enormous loss.

Calcium carbide is also the material from which is produced calcium cyanamid, a most important compound to-day in the field of fixation of atmospheric nitrogen.

Artificial graphite is an electric furnace industry that owes its inception and entire development to Niagara power. The production, which totals several thousand tons annually, falls in two general classes, electrodes and powdered graphite.

Graphite electrodes are used exclusively as anodes in all electrolytic cells for the production of caustic and chlorine. They are a fundamental requisite of this vast industry. With the supply of plantinum cut off they are now replacing this expensive metal as anodes in the electrolytic chlorate processes. Graphite electrodes are extensively used in electric, smelting and refining furnaces, producing high-grade steel, alloy-steels, ferroalloys, copper, zinc and nickel.

All the manufactured graphite used in the world is produced at Niagara Falls. It occupies a field of its own, which cannot be filled by natural graphite, and it is another striking illustration of the electric furnace "going nature one better."

Thus we see that the electric furnace is not merely a new metallurgical tool, but an important element in our economic life. When future generations begin to shiver for want of coal and to starve for want of nitrogen, the present generation will be remembered not as champions of the preservation of scenic beauty, but as champions of the ugliness of wasted resources.

THE CRUCIBLE SITUATION

THE crucible manufacturers have been put to sore straights for the past eighteen months in the securing of their raw materials. First came the embargo on Ceylon plumbago—(this being lifted after a few months) which left the market in a depleted condition. The natural result was a tremendous advance in price. Next came the exhaustion of the foreign clay, which is used in crucible making, as a binder. The clay used, as far back as crucible history in this country goes, has come from the little principality of Klingenburg in the Black Forest in Bavaria, where, so the story goes, the entire government expenses are paid out of the export duties collected from the clays shipped out. This Klingenburg clay has for years past, been the only clay the crucible makers seemed to think they could satisfactorily use. No shipments of this clay have been made since the beginning of 1915.

Some makers have husbanded the enormous supplies of the foreign clay which they had on hand when hostilities started. This husbanding the stock of the now almost priceless raw material, has been done by partially substituting clays from various parts of the United States, and mixing with the Klingenburg clay.

The tests and trials made by the crucible makers during the past twelve months have been almost endless. When one takes into consideration that it takes from six to ten weeks to prepare a graphite crucible for service in the foundry, some slight idea can be formed of what the crucible maker has to contend with. Added to this delay, and before he can even start in on these goods that will not be remarkable for two months to come, the chemists' laboratory tests and trials must be made. These

have run into the thousands. Then must come the practical tests in a small way in the foundry; for the crucible maker would stare bankruptcy in the face, if he continued making up hundreds of thousands of dollars worth of goods out of Ceylon plumbago, costing from seventeen and a half to twenty-five cents per pound, only to find at the end of two or three months that they might not be of service to the user.

The bright side, however, to all that, is that in many cases the crucibles made with American clays have gone a surprisingly long time in the fires. In one case there is a report on a No. 300, which ran forty heats on manganese bronze, and dozen of cases as high as thirty-eight and forty heats on No. 100's melting car box metal. The annoyances now seem to be the ununiformity of the products secured. Crucibles made by the same potter, out of similar materials, at the same time, and burnt in the same kiln, when run by one melter on same grade of metals, rise and fall to a variation that is a shock to both user and maker.

All this will in time be rectified. As soon as the manufacturer has become more familiar with the mixing and blending of our native clays, they will no doubt be able to produce in time a crucible as satisfactory as or superior to those manufactured heretofore. The user, however, must use more care in handling the American clay crucibles. It is imperative that these crucibles be thoroughly dry and warm before going into the fire, and that they are heated up very slowly on the initial heat. Some users make a little fire with charcoal inside the crucible, and others put hot ashes in, before placing the pot in the fire, so that the crucible is hot when it goes into the fire for the first heat. There are certain advantages in heating the crucible from the inside first rather than the outside. He must be very careful in the matter of wedging, as American clays have not the same tensile strength when hot, as foreign clay.

The advance in prices of crucibles is due to the unusually high price of Ceylon plumbago just at present, just as with zinc, copper, aluminum, lead, etc., but as soon as the war insurances are a thing of the past, then plumbago will be at a normal figure once more, and crucibles will again be marketed at as low or lower prices than they have been for many years past.

ONTARIO BUREAU OF MINES REPORT

THE demand for nickel and copper, due to the war, has been insatiable, and the Sudbury mines have shown a capacity for meeting the requirements which could scarcely have been anticipated. Such is the statement made in the report of the Provincial Bureau of Mines for the first three months of 1916. The output of nickel and copper in the matte was fifty per cent., greater than in the first three months of 1915. If the present rate of production is maintained through the year, 1916 will see about 40,000 tons of nickel and 22,000 tons of copper turned out by the smelters in the Sudbury district, as against 34,000 tons of nickel and 19,600 tons of copper in 1915. The Canadian Copper Co. and the Mond Nickel Co. are the producers; the Alexo Mine turning out a small quantity of ore, which is sold to the Mond Co."

Cobalt oxide and nickel oxide met with a rather better demand, though the quantities exported are still below those of normal times. Metallic cobalt is coming into use principally in steel alloys, and there is now a small quantity of nickel refined in Ontario from the silver cobalt ores of the Cobalt camp. Taking the figures as a whole, there are increases in all products except iron ore.

The total value of the production for the first three months of 1916 was $14,276,382, as compared with $9,358,210 for the corresponding period of last year. This large increase was due not only to the greater output but to the higher prices now prevailing for most of the metals.

Increase in Gold Yield

The increase in the yield of gold was 31,511 ounces, worth $656,872. Compared with the rate of production for the whole of last year the advance was less marked, but developments now under way are likely to lead to a substantial increase. Porcupine provided the bulk of the 107,818 ounces production, namely, 99 282 ounces. Hollinger led in output, followed by Dome, Acme, McIntyre-Porcupine, Porcupine Crown, Vipond, Schumacher and Dome Lake in descending order. The mines situate elsewhere making up the remainder of the yield are Tough-Oakes and Croesus. Consolidation of the Hollinger, Acme and Millerton interests, says the report, will no doubt lead to a more extensive development and a greater output from these properties.

Silver Yield

A feature of the quarter was an actual increase in the yield of silver as compared with the first three months of 1915, amounting to 67,664 ounces, from 5,230,167 to 5,297,831. In value the increase was proportionately greater namely $462,673. This was due to the remarkable rise in the price of silver, amounting to about 50 per cent. over the average figure for 1915. A large part of this increase took place in the latter part of the quarter and afterwards, consequently the benefit of the higher prices was only partially realized during the three months

The natural effect of the advance has been to stimulate both mining and prospecting in Cobalt and to enable low-grade ores in the mines or on the dumps to be worked, which at the former low prices of silver were without value. Nipissing continues to lead in quantity of output. Townsite-City, Seneca Superior, Kerr Lake, La Rose, Coniagas, Cobalt Lake, McKinley-Darragh-Savage, Beaver, etc., follow in the order named.

The blast furnaces of the Province produced about 70 per cent. more pig iron than they did in the first quarter of 1915, and the produce was worth almost 100 per cent. more. About 15 per cent. of the iron ore charged into the furnaces was taken from deposits in Ontario, the remainder coming from the United States.

CANADIAN OVERSEAS RAILWAY CONSTRUCTION CORPS

POWERFUL steam shovels, weighing sixty-five tons each, capable of eating up the earth at the rate of 150 to 200 cubic yards an hour, and self-propelling extension track pile drivers, are part of the equipment recently purchased by the Government for Col. C. W. P. Ramsay, of the Canadian Overseas Railway Construction Corps. This plant was selected by Col. Ramsay's colleagues in the Engineering Department of the Canadian Pacific Railway, and is being prepared by that company at the request of the Government for shipment abroad.

The Canadian Overseas Railway Construction Corps has already built many miles of track at strategic points, and is all the while engaged in surveys for further construction. The work has often to be done under fire, and though there have been many narrow escapes, there have been no serious casualties. Out of the non-commissioned officers and sappers that enlisted on the foundation of the Corps 18 have already received commissions in the Royal Engineers, a remarkable tribute to their efficiency, while Col. Ramsay and Major Harvey have been mentioned in despatches. The splendid work of these Canadian engineers has, we understand, been highly appreciated.

THE life of belting is chiefly dependent on:—1—the "total load" to which it is subjected: 2—how the belt is joined: 3—the speed at which it runs; 4—the care bestowed upon it: 5—whether it is kept free of mineral oils.

CONTEMPORARY WAR ARTICLES

Embracing Information and Data Drawn from a Variety of Sources Relative to and Arising from the Prosecution of this Many-Sided European War

BIG GUNS AND PROJECTILES

At a meeting of the Faraday Society of Great Britain recently, Dr. Rosenhain delivered his cinematograph lecture on "The Making of a Big Gun." Sir Robert Hadfield, the president, was in the chair, and in introducing the lecturer he gave a few historical notes which are of more than ordinary interest at the present time. After alluding to the fact that Hadfields had made a special study of projectiles for more than a generation, he mentioned that he had seen guns up to 16 in. calibre fired at various proving grounds, both private and Government, including Shoeburyness, Portsmouth, Gavers, Le Creusot, Sandy Hook, Indian Head, Ochta, Meppen, Magdeburg, and elsewhere, and had studied results of tests at foreign proving grounds, at Spezia (Italy) and Kure (Japan).

The largest gun he had seen fired was the 16 in., weighing about 120 tons and being 35 calibres in length. There was at the time only one gun in existence of this calibre, namely, at Sandy Hook. The shot weighed 2,400 lb. On one occasion the range attained was 21 miles. The round he saw was fired at a comparatively low velocity, about 1,400 foot-seconds, and was directed against a 12 in. hard-faced armor plate, inclined about 45 deg. Hence the blow was more of a glancing than an impact one, and the plate was cracked but not perforated. He witnessed the round about a quarter of a mile from the gun, and was able to observe the fragments as they ricochetted out to sea over a distance of about 1¼ miles. The gun was designed for coast defence purposes, and he believed a number of similar pieces had been made for the Panama defence scheme.

Internal Pressure Feature

Continuing, Sir Robert said that it must be borne in mind that, usually, when big calibre guns are referred to in the daily press, such as the 42 cm., they are really howitzers. In artillery parlance, a howitzer is not considered to be exactly a "gun." Its internal pressure very seldom exceeds 14 or 15 tons per square inch, and is generally not so much as that, whereas a real gun, such as is used in the navy or for coast batteries, has to stand a pressure of 20 tons per square inch.

J. A. Longridge, in his excellent series of papers given before the Institution of Civil Engineers between 1879 and 1884 on "Wire Gun Construction" and "The Construction of Heavy Ordnance," and also in his book "The Artillery of the Future" and the "New Powders," published in 1891, said that it would some day be possible—in fact, at the time of making the statement he said that he was prepared to do it—to make guns to stand up to 30 tons pressure. Sir Robert wondered why this subject had not been followed up.

As regards our own service, it is, he said, well known that we have 13.5 in. and 15 in. guns of the highest possible quality. The results obtained reflect great credit upon the British artillery engineer and the metallurgist, who by their combined efforts have produced guns giving, as they have done, splendid results, in fact, no fault has been found with them in service. They are wire-wound, and he thought it might be of interest to state—and it was an open secret—that a certain foreign nation about two years before the war broke out, desiring to order big naval guns, sent a commission to visit the various big gun-making centres of the world, and this commission unanimously reported that the British wire-wound gun was the best which could be produced.

Muzzle Energy Feature

Whatever the future has in store in the way of developments of the power of such guns, whether by means of increased calibre or by constructing calibres such as now made to stand higher pressure, he was quite sure that the British artillery engineer and the metallurgist would continue to hold the proud position they at present occupy of building the most powerful guns the world has yet produced; that is to say, the muzzle energy of British guns outranks that of the guns of any other nation. The 16 in. American gun to which he had previously made reference, whilst not of the howitzer type, had nothing like so great a muzzle energy as, for example, our 15 in. naval gun, and the so-called big German guns, about which there had been so much talk in the papers, are as regards their muzzle energy very small and inferior weapons in comparison with ours. With some of our naval guns it would be quite possible to send a shell over Mont Blanc.

Modern Gun a Heat Engine

The modern gun, said Sir Robert, is really a heat engine, and a few of the feats which I myself personally have been in touch with—that is, the results obtained from what may be termed the modern high-speed and great-power engine known as the gun, may be of interest. For example, I well remember many years ago at Shoeburyness a 9.2 in. armour-piercing shell being fired through a 9 in. armor plate known as "compound," that is, of combined iron and steel. The shot perforated the plate and backing, got out of the sand butt, and was recovered whole, and alongside it, to the general surprise, was found a small rabbit. A big gun for little game!

Another instance I well remember. A 9 in. wrought iron plate was being attacked by a 9.2 in. Whitworth shot. This plate was swung upon trunnions projecting from either side. In other words, before firing it would have been possible with comparatively little energy to make the plate swing backwards and forwards. When the Whitworth shot was fired against this plate and perforated it, the plate was lifted from its trunnion seating and thrown away some 10 feet, or 12 feet, yet the hole was properly punched in the plate. That is to say, before the plate had time to swing the shot passed through it. This brings home a fact which is perhaps not sometimes realized, namely, the enormously rapid action of the shot in perforating. For example, a 15 in. shot going through a 15 in. plate would perforate it in about one-thousandth part of a second—probably in even less time. It will be understood, then, what tremendous stresses are suddenly brought to bear upon the shot, and how the slightest flaw or imperfection of any kind will wreck it.

Another instance may be mentioned. This refers to old experiments, but nevertheless is interesting. One of our 6 in. shot was fired against a 9 in. compound plate and recovered unbroken. It was so little injured that it was put in the gun and fired again. A second 9 in. plate was also perforated, the shot being recovered unbroken but slightly ground. It was fired a third time against a hard-faced plate, and being uncapped, of course broke. This illustrates how well a shot properly hardened and tempered can resist the enormous complex stresses suddenly brought to bear. In other words, the shot by means of its quality, and when possessing enough energy, is thoroughly master of its work against any type of plate without a hard face.

To overcome the hard face the modern cap has been introduced. This enables even the hardest face to be perforated. It is curious to find that caps have to

swell to the full diameter; in other words, the shot has to pass through the cap. The cap is not merely dispersed as might be expected. The action is, however, very sudden and the soft metal of the cap expands, so that it is really punched; the expansion or elongation of the mild steel taking place so quickly that it does not break until practically the full diameter of the shot has been reached. It is no doubt owing to this fact and to the radial inertia of the cap itself that a modern cap is enabled so completely to protect the shot that the latter then passes unbroken through the armor plate attacked; that is, before the face of the plate is reached, certain support is afforded long enough to the point of the shot to give it time to transfer some of its energy to the plate attacked. We are indebted to the Engineer for the foregoing.

SHELL MACHINING EQUIPMENT—II.

IN our May 18 issue, equipment for 4.5 in. high explosive shell manufacture, covering boring and turning lathes, thread milling and waving machines, chucks, etc., together with operation features, were discussed as far as the shell nose machining procedure. The latter constitutes the substance of what follows.

Nose Piece Machining

The machinery of the shell body thus has devoted to it twenty of the lathes in the whole plant. The remaining seven lathes are devoted to the machining of the nose piece. The first operation is to cut off suitably sized pieces from stock bars. For this, one machine of the turning lathe type is used. The second operation is to bore and taper such cut-off piece. Two machines of the boring class are given over to this operation. The chuck used grips the work at three points, two of these being flat key-like strips and the third a set screw.

The third operation on the nose piece consists of forming it roughly to the required curvature—roughly because its finished shape is given it under operation sixteen on the shell body. One tool of the turning lathe type is employed for this stage of the work. A plate having a coned central boss is bolted to the end of the hollow spindle of the lathe. The usual pull-up passes through the coned boss, and at its end is provided with a nut and a U-shaped washer. With the pull-up rod slackened a little, the U-shaped washer can be removed and the work pulled off the conical boss and over the nut on the end of the rod. The point of the tool is induced to follow the required curve by connecting the tool slide to a radius link, which at the other end is pivoted to a cast iron bracket bolted to the side of the lathe. The tool slide is otherwise free to move on the saddle cross guides. Hence, as the saddle is fed towards the work the tool point moves towards the operator, so generating the required curve.

As actually carried out, the tool slide is in two parts, one carrying the tool post and the other the pivot pin for the radius bar. A threaded spindle passing through a nut in the former part and fitted at its end to the latter joins the two. By rotating this spindle the tool can be drawn in or pushed away from the pivot pin, so permitting the depth of cut taken to be varied.

The cut in the above operation is not carried right to the end of the nose piece, for in the next stage this end is turned down parallel to receive the thread whereby the nose piece is fixed to the shell. For this operation one lathe of the turning type is set apart. A recessed plate is bolted to the hollow spindle end, and through the boss of this plate there passes a bolt which at one end is threaded over the pull-up rod and at the other is provided with a conical plug—not U-shaped—and a nut. The nut and plug have to be removed to unchuck the work. The nut thread fits the end of its bolt loosely, and the nut is locked tightly when chucking a piece by the pull-up rod. The whole chucking operation, we understand, occupies not more than fifteen to twenty seconds.

The fifth operation on the nose piece is the milling of the thread on the turned down portion left by the previous operation. For this one thread-miller is employed. The method of holding the work is identical with that used in operation four.

In operation six the nose piece is turned about and the parallel bore milled for the fuse thread. One thread-miller is provided for this. A plain tapped plate is bolted to the hollow spindle end. The thread in this is a loose fit for the external thread on the nose piece. The pull-up rod carries a piston-like member provided with a conical nose or boss which, when pressed into the conical bore of the work, steadies and locks it. Cuts and data, courtesy The Engineer, London, England.

CANADIAN GOVERNMENT TELESCOPE COMPLETED

THE work of two and one-half years by the Warner & Swasey Co., Cleveland, Ohio, the largest reflecting telescope in the world, was put on exhibition at the company's plant last week. Scientists of international reputation from all parts were present.

The telescope is for the Dominion Astronomical Observatory being completed near Victoria, B.C., by the Canadian Government.

This telescope is to be used principally for measuring velocity of the fainter stars, either toward or from the earth. With this instrument it will be possible to expose the most sensitive of photographic plates for five or six hours and in this manner gather details about some of the stars that have hitherto been inaccessible.

The 72-inch reflector in the instrument makes possible the additional research. The fact that it collects nearly 50 per cent. more light than any other reflector adds to the photographic possibilities. The telescope is of the type scientifically known as equatorial, swinging on a polar axis which parallels the earth's axis. The instrument weighs fifty-five tons and will rest on massive piers reaching to bed rock.

In spite of the enormous weight the instrument is so delicately balanced and has such smoothly working bearings that an electric current sufficient to burn an ordinary incandescent light will control it. A luncheon was given by the company officials in honor of Dr. Plaskett, Ottawa, head of the new observatory, at the Union Club. Noted scientific men present were:

Dr. John A. Brashear, Pittsburg, ex-chancellor of the University of Pittsburg; Dr. Charles S. Hastings, Yale University; James B. McDowell, of the John A. Brashear Co., Pittsburg; Alexander Duval, of National Optical Glass Co., Washington, Pa.; Dr. W. J. Hussey, director of Detroit Observatory, University of Michigan, Ann Arbor; Dr. R. H. Curtis, astronomer, University of Michigan, and E. D. Pearce, Providence Institution for Savings, Providence, R.I.

Among prominent Clevelanders present were:

Ambrose Swasey, Worcester R. Warner, William D. B. Alexander, Elbert H. Baker, Major P. S. Bond, Charles F. Brush, Edward P. Burrell, A. C. Cook, George A. Decker, F. H. Ginn, Dr. E. P. Hyde, Francis F. Prentiss, Frank A. Scott, Warner Seely, Leslie B. Stauffer, Lyman H. Treadway and Samuel T. Wellman.

"More Oil" Signal.—Near our plant, says an exchange writer, is a mill in which there is a central oiling system, the main oiler in the engine room holding about 15 gallons. As long as the mill engine is in motion the pump forces oil through all the small pipes to the gun feeds, niggers, trips and transfers; but with all the oil that is used, and with an engineer in constant attendance, with an oiler whose duty alone it is to see that oil is passing in all the sights to each appliance being supplied, it is a regular thing to hear each day the signal whistle from the various machines for "more oil." What is wrong?

PROGRESS IN NEW EQUIPMENT

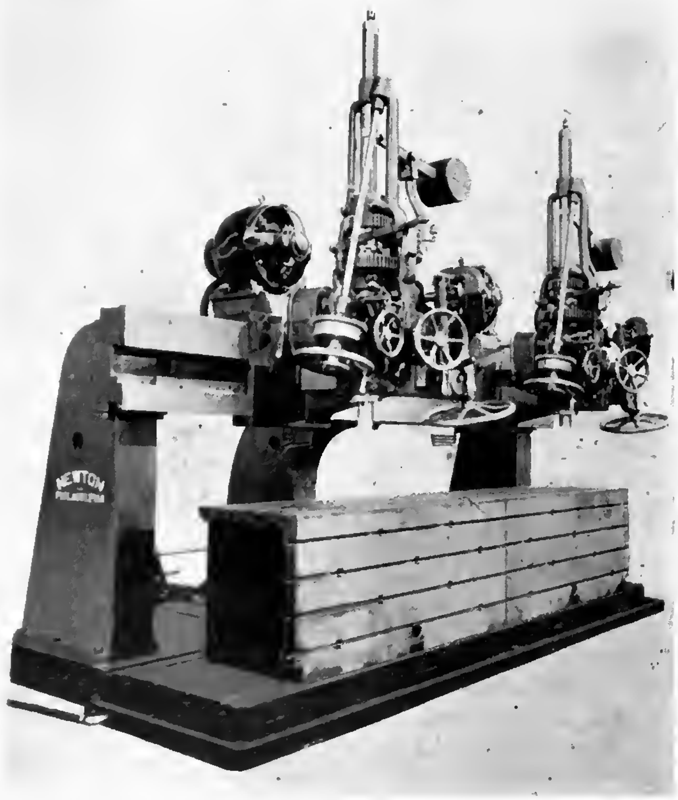
A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

TWO-SPINDLE FRAME DRILLING MACHINE

THE accompanying photograph illustrates a new design of drilling machine having sufficient range and flexibility of operation to handle all the parts necessary in the construction of locomotives from the smallest to the largest in addition to being particularly adapted to drilling locomotive frames.

The spindles of the machine are 4 in. in diameter, have an automatic geared feed of 18 in. and a vertical adjustment of 18 in. through direct connected gearing for the fast hand traverse and through a friction clutched worm and worm wheel for the hand slow adjustment. There are provided four changes of friction clutched geared feed ranging as follows:—.0078 in., .0126 in., and .0156 in. and .0185 in. per revolution of spindle. The range of the spindle speeds is from 28 to 456 r.p.m.

The drive to the spindles is by individual 10 h.p. motors running at from 300 to 1,200 r.p.m. motion being transmitted through the horizontal driving shaft on which is mounted a double train of bevel clutched gears and further through the vertical shaft on which the back gears are mounted, giving two changes of speed in addition to the range of the motor.

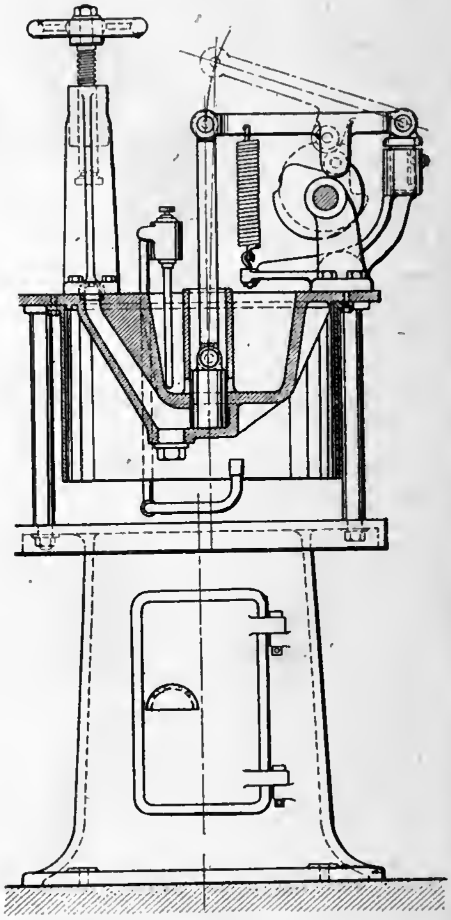


TWO-SPINDLE FRAME DRILLING MACHINE.

The spindle is counterweighted and is provided with a roller thrust bearing at the bottom of the rack sleeve. A No. 5 Morse taper is provided with retaining and drift key holes. Reversing fast traverse is provided to the saddles on the rail from a minimum distance between centres of spindles of 48 in. to maximum distance of 15 ft. hand horizontal adjustment to the saddles being obtained by the hand wheel shown at the bottom of the arm.

The gears controlling the feed are mounted in a box, the different combinations being engaged by a spring key controlled by the small hand levers shown. There is also provided lateral hand adjustment to the spindle saddle on the arm from a minimum distance of 6 in. to a maximum distance of 24 in. from the face of the cross rail. The arm has two bearings on top of the cross rail made removable for renewals and has square lock gibbed bearings cast solid with brass taper shoes to compensate for wear.

The motor bracket is cast solid with the arm giving a very rigid construction necessary for continued service under the enormous strains to which these machines subjected when using modern



DIE-CASTING MACHINE. ELEVATION.

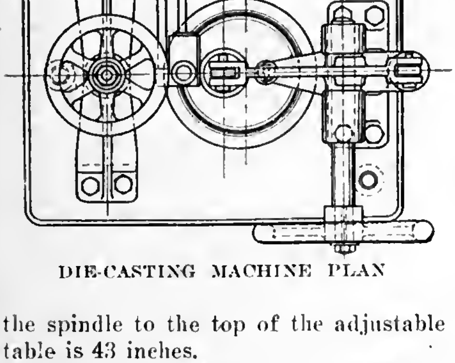
high speed drills. The cross rail is of the box type construction of very heavy section further supported by ribs. The machine is furnished with two adjustable work tables 30 in. wide by 36 in. high by 7 ft. 6 in. long, each of box type construction, having vertical and horizontal working surfaces substantial tee slots having been provided for the work.

The machine has a floor plate the front of which forms a tee-slotted work table, entirely surrounded by an oil pan for catching the lubricant and the remainder supporting three heavy uprights for holding the cross rail.

Screws are provided for adjusting the work tables, through individual 5 h.p. motors, permitting of simultaneous or independent power hand adjustment to the work tables. Pump piping and attachments are also provided.

The maximum distance from the floor plate to the bottom of spindle is 81 in.,

the maximum distance from the end of the spindle to the top of the adjustable work table is 48 in. and the minimum distance from the top of floor plate to the bottom of the spindle is 64 in. and the minimum distance from the end of



DIE-CASTING MACHINE PLAN

the spindle to the top of the adjustable table is 43 inches.

The Newton Machine Tool, Works, Inc., Philadelphia, are the builders of this machine.

NEW DIE-CASTING MACHINE

AN interesting design of die-casting machine has been recently patented and placed on the market by the Monometer Manufacturing Co., Birmingham, Eng., who have constructed it with a special view to the use of aluminum and its alloys, while giving equally as good results with other metal alloys.

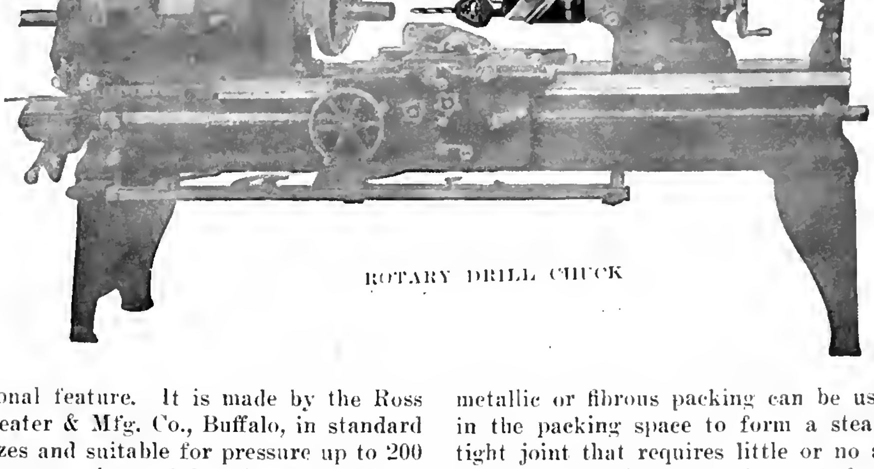
The apparatus consists of a gas-fired melting pot with suitable extruding mechanism and die clamp mounted on a cabinet base as shown in elevation and in the illustration. The melting pot; shown in section, is provided with a hollow cylinder extending upwards from the centre of the bottom, port holes on the sides allowing metal from the pot to enter the cylinder when the piston is elevated, and an inclined passage connecting the lower end of cylinder with the die clamped in place on top of discharge orifice.

The movement of the piston is controlled by a hand operated cam-shaft which elevates the rocking lever to the position shown by the dotted lines thus causing the piston to rise past the ports and allow the metal to enter the passages. The cam is of such a shape that the piston is raised slowly and then returned with a sudden drop due to the pull of the spring on the rocking lever, it being claimed that the rapid injection of the metal produces very sound and homogeneous castings.

The pot is made of metal of a special composition which resists the action of molten aluminum, while the gas supply to the burners is controlled by thermostatic device which automatically controls the temperature at a given point.

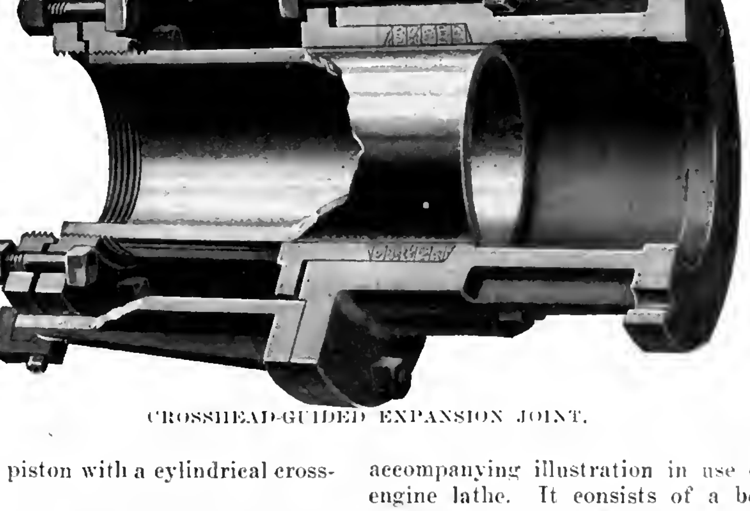
CROSSHEAD-GUIDED EXPANSION JOINT

THE accompanying illustration shows a sectional view of the Ross crosshead-guided expansion joint, which is so named because of a prominent constructional feature. It is made by the Ross Heater & Mfg. Co., Buffalo, in standard sizes and suitable for pressure up to 200 lb. per sq. in., and for pipes up to 24 in. diameter.



ROTARY DRILL CHUCK

The joint is formed of two members which slide one within the other, the outer one being made in two parts, which are bolted together at the outside circumferential joint near the centre, while the inner member is composed of a sleeve, one end of which passes through the gland and stuffing box formed in one part of the outer member, while the other end is supported by companion flanges as shown. These flanges are accurately machined on the diameter so as to slide smoothly and freely in the bore of the outer member or guide, the action of the inner member being precisely that of a trunk piston with a cylindrical crosshead.



CROSSHEAD-GUIDED EXPANSION JOINT.

The desirable support thus given to the crosshead flanges keeps the sleeve in proper alignment with the outer member, and prevents sagging strains from destroying the packing and causing other excessive tear and wear. Access to the stuffing box is readily obtained by removing the bolts on the guide flange and sliding the casing back. Any kind of metallic or fibrous packing can be used in the packing space to form a steam-tight joint that requires little or no attention. Occasional drawing up of the packing gland can be done from the outside by means of the long bolts shown.

As the inner area of the slipping section is equal to the area of the pipe, a state of balance is obtained in the joint which relieves the stress that would otherwise occur. Joints intended for use at points where elbows or tees for branch lines are located have anchorage footings cast on to give the required support to vertical pipes and fittings.

MULTIPLE ROTARY CHUCK

AN appliance which the makers term a Multiple Rotary Chuck is shown in the accompanying illustration in use on an engine lathe. It consists of a bearing bracket, which is clamped to the tail-stock spindle, and carries a revolving turret holding five tools, which are

brought into operation as required and locked accurately in position. For suitable classes of work this enables a lathe to be quickly converted in a turret lathe on which drilling, tapping, counterboring, reaming, etc., can be performed without loss of time in changing tools.

The device is of substantial construction, being capable of drilling up to $1\frac{1}{2}$ in. dia. hole, and weighs 27 lbs. It is built by the Newman Mfg. Co., Cincinnati, O.

ROYAL CANADIAN INSTITUTE BUREAU OF SCIENTIFIC AND INDUSTRIAL RESEARCH

A BUREAU of Scientific and Industrial Research has been founded by the Royal Canadian Institute, Toronto, to carry on work in Canada on the same lines as that now carried on by the Mellon Institute of Pittsburg, Pa., and other like institutions in the United States and elsewhere. The Royal Canadian Institute is particularly fortunate in having for its president, during the formative stages of this bureau, Dr. John Cunningham McLennan, B.A., Ph.D., F. A. A. S., F. R. S. C., F. R. S., Professor of Physics and director of the Physical Laboratory, at the University of Toronto.

Associated with Dr. McLennan in the work, and as vice-presidents of the Royal Canadian Institute, are John Murray Clarke, K.C., who is well known throughout the country as a progressive leader and author, and Dr. Alexander Charles McKay, principal of the Central Technical School, Toronto, whose great object in life is the up-building of industrial education, in which sphere he has already attained marked success. The work has also the support and co-operation of a number of other prominent men, including three Fellows of the Royal Society.

Co-operation of Industry and Learning

The idea of the fellowship system in the application of science to industry was first thought out by the late Dr. Robert Kennedy Duncan, a distinguished graduate of the University of Toronto, the first director of the Mellon Institute, Pittsburg, after prolonged visits in Europe during 1904 and 1907. Through his visits to workshops, laboratories and universities of most of the principal countries of Europe, and through his talks with industrialists, Dr. Duncan became impressed with the spirit of co-operation which existed abroad between industry and learning, and which made for the advancement of both. The industrial fellowship system occurred to him as a sane, practical scheme of relationship between industry and learning, which would promote the efficiency of American industry.

Research Procedure

When a problem is assigned to the Institute, the director selects, after careful inquiry, the best available man who can be found for this particular work. The fellow, as this man is called, is one who has invariably pursued post-graduate work in a special field, and has shown a gift for research. This man, if the fellowship has been given by an operating concern, first spends sufficient time in the factory of the donor to become acquainted with the problem at first hand. In this way he gains a knowledge of the manufacturing conditions which must be met and, when the time comes, introduces the results of his research work into the factory. He then returns to the Institute and examines the literature of the subject under investigation, in order to familiarize himself with what others have done on the problem. After this preliminary work, he is assigned a laboratory, and begins what may be termed the test-tube scale of experimentation.

The fellowships which have come to the Institute have been on such diverse subjects as the chemistry of bread and baking, problems relating to petroleum, the corrosion of steel, the technology of soap and soap fats, the bleaching of animal and vegetable oils, problems relating to the manufacture of foods, the development of steam power accessories, the fixation of nitrogen, problems of hydro-metallurgy, the development of pharmaceutical preparations, the technology of glass, the production of nitrogenous and phosphatic fertilizers, and the utilization of mineral wastes.

The Institute is, as its name implies, an organization devoted to industrial research, and as such, it is in a position to assist industrialists in engineering fields as well as in the fields of pure and applied chemistry. Knowledge of the crying need existing for such an institution in Canada cannot be made too widely known. At present, with the comparatively small amount of manufacturing done in Canada, problems a-plenty are awaiting solution, but when once the development of Canada's enormous supplies of raw materials by means of her immense resources of power gets fairly under way, nothing but the most efficient organization will suffice if industry is to receive the impetus it should from scientific progress and research.

The Time Opportune

To-day industries are being established in America which have previously been the exclusive property of the European countries, especially Germany. The United States is at last awake to the necessity of fostering these industries by providing facilities for research, and if Canada is to have her fair share of them she must act at once. We must conduct propaganda to make our manufacturers and capitalists realize the creative power and earning capacity of industrial research. We must remember that after the military operations have ceased we will be at war with the most strongly fortified industrial position in the world. German commerce is not destroyed—merely have some of its antennae been lopped off. However, if we are willing to learn, the outlook is bright. We possess resources, to which Europe has nothing to compare, and with the impetus given by present war conditions, a little faith and sustained effort, and the development of and appreciation by our financiers and business men of the earnings power of research, we may hope to develop a great chain of interlocking industries by science.

The Royal Canadian Institute, in founding the Bureau of Scientific and Industrial Research, is imitating the Mellon Institute of Pittsburg, because it has every reason to believe that this is the most practical plan for accomplishing their purpose yet devised. There is no reason why the same success should not attend it in Canada as in Pittsburg. That institution founded with only the most meagre support has, in less than a decade, grown so that over two score researches are continually in progress and a quarter of a million is annually disbursed in salaries and up-keep. The plan has shown itself sufficiently practical to encourage Pittsburg's two leading bankers to endow it and lend their names to it. The financial returns to manufacturers have already run into millions and on the human side scores of young men have had a chance to distinguish themselves in the field of applied science, at the same time contributing to the wealth and welfare of the people at large. In commenting on the scheme recently in England, Sir Wm. Ramsay and Prof. Henderson (of Glasgow), both recommended its adoption in England and called it "eminently practical."

When Dr. Duncan was founding the Mellon Institute, he met a few leaders of industry, the University of Pittsburgh, and some other interests sufficiently far-sighted to supply the $10,000, with which the institution carried on its early work. Surely Canadian manufacturers, and others will be sufficiently aroused to do as much. The Pittsburg men were asked to give to what then was an unknown experiment — now, the Royal Canadian Institute is asking support for an undertaking that has been tried and proved successful. In addition to the work of its bureau, the Royal Canadian Institute will continue its other scientific work. The Institute has to its credit many notable achievements including the establishment of standard time throughout the world and has been recognized as of national importance.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. JUNE 1, 1916 No. 22

CAPTURING ENEMY TRADE

WE are inclined to think that up to the moment little headway has been made, or more properly speaking, little enemy trade has either been appropriated or negotiated. True it is that much organization toward that end has been created, organization at once influential both from the nature of the commercial interests concerned and from the Governmental recognition exemplified in Trade Commission appointments.

It is quite evident that German trade competition after the war is being anticipated, whether the latter arise from known facts in the possession of those whose official positions necessarily keep them posted as to our enemy activities, or whether it be simply a logical deduction based on enemy experience in the past. No scheme of real practical value has yet been evolved, much less launched, whereby the end sought has been brought appreciably nearer to fulfilment. Suggestion, doubtless, has been plentiful, but all of it displays a lack of knowledge of what there is intended to combat and conquer.

Most of the schemes propounded are, it seems to us, much too ambitious and are indicative of the "wish being father to the thought." They have further the somewhat undesirable tendency to, if not frustrate individuality, at least stifle it, with the result that inaction on the part of commercial and manufacturing managements ensues. Initiative in the unit sense ceases to be a factor, and the impression grows that the task of capturing enemy trade is so gigantic as to require some drastic legislative enactment or something of an equally stupendous nature.

Trade and commerce are constitutionally complex, and in a world-sense are very much so; they are, however, readily amenable to individuality of operation. Their essence is individual enterprise and will continue so to be irrespective of any national or Empire plan of campaign to capture enemy trade. It follows therefore that each Canadian manufacturer should act his own part in the latter direction—in a word set about securing his particular share, and in the event of collective organization or Government enactment materializing, appropriate what further aids these may afford.

It has been said that each manufacturer can think out a plan to develop some part of his business a little more than has yet been done or has even been attempted, and this without waiting for ambitious and all-comprehensive schemes that are probably beyond the ken of human to evolve. Each can be keenly alert and active to seize the many opportunities—big and little now presenting themselves, and by so doing not only help himself, but contribute the quota necessary to our national and Imperial achievement.

SHIPBUILDING IN CANADA

IT is not to the question of whether the vessels built by Canadian shipbuilding plants now or in the immediate future would contribute to the relief of the war-created shipping stringency, but rather the taking of steps towards our future national commercial ascendency that Sir Robert Borden and his Government should turn their attention and be prepared to give national help and active support. The fostering of shipbuilding in Canada is perhaps at the moment the livest topic in the realm of public opinion from our Atlantic to our Pacific Coast, and it is just sufficiently deep-rooted as to be unmoved by shallow excuse or unnecessary parleying.

Canadian shipbuilders are prepared to show not only what they can do to offset war-time disabilities, but to further our shipping and commercial enterprise following peace; the indifference shown by and repeated rebuffs at the hands of so-called representative Government at Ottawa, notwithstanding.

There is a widespread desire that Canada should not only possess a larger merchant marine, but also that she should play the major part at least in producing it. All who are in accord with a shipbuilding propaganda do not of course fully appreciate what is involved. It may not be too clearly apparent to many that construction costs in Great Britain in pre-war days were very much lower than those in Canada, relative to both wages and material, and that the Motherland was our real and only competitor, the vessels built by her entering Canada duty free. To stimulate Canadian shipbuilding by a tariff enactment against Britain and admit at the same time materials of construction, duty free, are directions in which public opinion is not likely to express itself too favorably. The opposition of our manufacturers generally would not fail to assert itself, and not without good reason, as the altogether free importation of shipbuilding commodities would hinder rather than help thereby the myriad industries auxiliary to the prosecution of shipbuilding and marine engineering on a comprehensive scale.

Shipbuilding is wanted to be firmly established on our shores as much for the sake of our general industrial enterprises as for its own; therefore, the plan or scheme for its encouragement must embody that provision. A bounty as proposed by Col. Cantley in his recent address before the Canadian Manufacturers' Association at Montreal, seems therefore the only reasonable solution to meet fully the situation in its diversity, and we would suggest that our shipbuilding administrations get together so as to determine both the bounty extent and its probable period of duration. By doing so, they will be able to place their proposition before the authorities at Ottawa in concrete form and therefore with more certainty of its being at last accepted.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

	Montreal	Toronto
Grey forge, Pittsburgh	$18 70	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Victoria, No. 1	$27 00	$25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base, Toronto	3.00
Steel bars, base, Toronto	3.25
Steel bars, 2 in. and larger, base	5.25
Iron bars, base, Montreal	3.00
Steel bars, base, Montreal	3.25
Twisted reinforcing bars, base	3.30
Bessemer rails, heavy, at mill	2.50
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	...
F.O.B., Toronto Warehouse.	**Cents**
Steel bars	3.25
Small shapes	3.75
F.O.B. Chicago Warehouse	**Cents**
Steel bars	3.10
Bars, 2 in. and up	4.00
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper, carload	$32 00	$31 50
Electrolytic copper	32 00	31 25
Castings, copper	31 00	31 00
Tin	49 00	52 00
Spelter	19 50	19 50
Lead	9 25	9 50
Antimony	38 00	40 00
Aluminum	68 00	65 00

Prices per 100 lbs.

BOILER PLATES

	Montreal	Toronto
Plates, 1/4 to 1/2 in.	$4 00	$4 25
Heads	4 25	4 50
Tank plates, 3-16 in.	4 30	4 75

WROUGHT IRON PIPE

Prices in effect April 26, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 06	5 31
1/2 in.	3 91	6 08
3/4 in.	4 72	7 65
1 in.	6 97	11 31
1 1/4 in.	9 43	15 30
1 1/2 in.	11 28	18 29
2 in.	15 17	24 61
2 1/2 in.	23 99	38 90
3 in.	31 37	50 87
3 1/2 in.	37 72	61 18
4 in.	44 69	72 49

Lapweld

	Black	Galv.
2 in.	$17 02	$26 46
2 1/2 in.	25 16	40 07
3 in.	32 90	52 40
3 1/2 in.	39 56	63 02
4 in.	46 87	74 67
4 1/2 in.	57 15	90 81
5 in.	66 60	105 82
6 in.	86 40	137 28
7 in.	116 62	179 70
8 in. x 25 lbs. per ft.	122 50	188 75
8 in. x 25 lbs. per ft.	141 12	217 44
9 in.	169 05	260 48
10 in. x 32 lbs. per ft.	156 80	241 60
10 in. x 40 lbs. per ft.	201 88	311 06

List for Ontario, Quebec and Maritime Provinces

OLD MATERIAL

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 00	$17 50
Copper, crucible	20 50	21 00
Copper, heavy	20 75	21 00
Copper wire	20 75	21 00
No. 1 machine compos'n	16 00	16 00
No. 1 compos'n turnings	13 75	14 00
New brass clippings	15 25	14 00
No. 1 brass turnings	12 00	12 00
Heavy melting steel	9 00	10 00
Boiler plate	11 75	10 50
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	11 50	10 00
Stove plate	10 50	10 50
No. 1 machin'y cast iron	14 75	14 50
Heavy lead	6 75	7 25
Tea lead	5 75	6 25
Scrap zinc	12 50	14 00
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Coach and lag screws	50
Stove bolts	62 1/2
Plate washers	25
Machine bolts, 3/8 and less	40
Machine bolts, 7-16 and over	30
Blank bolts	30
Bolt ends	30
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in.	$3.75 per lb. off
Nuts hex., over 1 in.	$2.00 per lb. off
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	37 1/2
Boiler rivets, base 3/4-in. and larger	$4.85
Structural rivets, as above	4.75
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS

	Per Cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	50
Finished Nuts over 1 in.	37 1/2
Semi-Fin. Nuts up to 1 in.	50
Semi-Fin. Nuts over 1 in.	37 1/2
Studs	45
Taper pins	.65
Coupling bolts	net
Planer head bolts, without fillet	.15
Planer head bolts, with fillet	net
Planer head bolt nuts up to 1 in.	.60
Planer head bolt nuts, over 1 in.	.55
Planer bolt washers	list plus 10
Hollow set screws	list plus .20
Collar screws	list plus .20
Thumb screws	.20
Thumb nuts	.75

BILLETS

	Per gross ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES

Standard steel wire nails, base	$3 70	$3 40
Cut nails	3 40	3 40
Miscellaneous wire nails		65%
Pressed spikes, 5/8 diam., 100 lbs.		$3 90

MISCELLANEOUS

Solder, guaranteed	0.31
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	3.00
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.18
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls., gal.	0.68
Linseed oil, raw, single bbls.	0.82
Linseed oil, boiled, single bbls.	0.85
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Packing, square headed	0.25
Packing, No. 1 Italian	0.30
Packing, No. 2, Italian	0.23
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per Cent.
Standard drills to 1½ in.	45
Standard drills over 1½ in.	5
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	net
Bit stock	55
Ratchet drills	net
Machine bits for wood	15
S.S. drills for wood	45
Wood boring brace drills	25
Electricians	29
Sockets	30
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks ....list plus	5
Bridge reamers	55
Centre reamers	net
Chucking reamers	net
Hand reamers	5

High-speed drills up to 1½ in. and over 1½ in. Double list plus 20 per cent.

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60 per cent.; headers, 60; flanged unions, 55; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$4 15	$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 50
Canada Plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 75	7 75
Fleur-de-Lis, 28 B.W.G.	7 35	7 35
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	7 00	7 00
Premier, 10¾ oz.	7 30	7 30

PROOF COIL CHAIN

¼ in.	$8.35
5-16 in.	7.35
⅜ in.	6.90
7-16 in.	6.75
½ in.	6.55
9-16 in.	6.55
⅝ in.	6.35
¾ in.	6.15
⅞ in.	5.95
1 inch	5.75

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B B

⅛ in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16 in.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	60-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	.....
1¼ in.	19 55	.....
1½ in.	19 55	12 70
1¾ in.	24 20	12 70
2 in.	24 20	14 00
2¼ in.	26 60	16 00
2½ in.	29 00	18 00
3 in.	38 70	21 00
3½ in.	44 00	25 00
4 in.	49 50	31 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 7.25
Galvanized, 24 wires, 1 in.	21.00
Black, 19 wires, ⅜ in.	6.00
Black, 19 wires, 1 in.	18.50

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	40%
Standard	40 & 10%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun. Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun. Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto

WASTE

WHITE	Cents per lb.
XXX Extra	.16
Peerless	.16
Grand	.15
Superior	.15
X L C R	.14
Atlas	.14
X Empire	.13
Ideal	.13
X press	.12
COLORED	
Lion	.10¼
Standard	.9¼
No. 1	.9¼
Popular	.8¼
Keen	.7¼

WOOL PACKING

Arrow	
Axle	Prices on
Anvil	application
Anchor	

WASHED WIPERS

Select White	
Mixed colored	Prices on
Dark Colored	application

This list subject to trade discount for quantity

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.37 to .39
Tin	.58 to .60
Zinc	.26 to .28

Prices Per Lb.

COPPER SHEETS

	Montreal	Toronto
Bars, ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 m..	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

BRASS

Brass rods, base ½ in. to 1 in. rd..	0.55
Brass sheets, 8 in wide 20 oz.	0.60
Brass tubing, seamless	0.55
Copper tubing, seamless	0.55

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American..	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass...	.15 to .25

Prices Per Lb.

RUBBER BELTING

Standard	50%
Best grades	30%

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy	.35
Copper sulphate	.15-24
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)..	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

quoting up on galvanized sheets, despite the decline in the price of spelter; in fact, local dealers report an advance of 25 cents on Queen's Head and 10 cents on Fleur-de-Lis; present quotation being $7.75 and $7.35 respectively. Recent heavy demand for wire and wire products may result in a further advance.

Metals

Copper is quiet and weaker. Tin is developing a little strength, following a quiet period. Spelter continues to fall off, and buyers are scarce. Lead is in poor demand, and small dealers are offering metal at reduced figures. Antimony is still going down and demand is light.

Copper.—After June 1st no buying will be allowed in Britain without a Government permit, the prohibition of speculative dealings having resulted in bringing considerable metal on the market. A recent decline of £4 on electro is noted in London reports, which indicates a drop of £10 in about two weeks. During the same period the quotation on standard spot shows a decline of £20, the current nominal price being £121. With a decline of approximately £15 in two weeks, futures are quoted at £120. New York reports a dull market, with an evident undertone of weakness. Prices on the New York market are relatively firm, nominal quotations being 29 cents for lake and 28½ cents for electrolytic. With a decline of 1 cent on lake, local dealers are quoting 32 cents, with prices firm on electro and castings, which are 32½ and 31 cents respectively.

Tin.—A firmer tone prevails in the tin situation, and prices are becoming steadier, satisfactory quantities arriving from London, with the result that the spot market is well supplied. London reports a quiet market on declining prices; standard spot is now quoted at £193, with futures at the same figure. Straits tin is quoted at £194, which is £4 lower than two weeks ago. New York quotations, after a decline of 1¼ cents on the week, are again advancing, a recent advance of ¼ cent placing the nominal price at 48 cents per pound. Local conditions are unchanged, and dealers are quoting last week's price of 49 cents per pound.

Spelter.—Despite the fact of lower prices being quoted on spelter both here and abroad, the market is very quiet and business is relatively dull. It is believed that still further reductions are not improbable. A decline of £5 on the London market has not resulted in any material activity, as the cost of importation is still very high. Present quotations are £90 for spot and £75 for futures. Easier prices also prevail in New York, and the current nominal price is about 14¼ cents per pound. Conditions abroad have affected the local situation, and dealers here are quoting 20¼ cents, which is a decline of 1 cent.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., May 29, 1916.—Continued activity in the production of large shells is one of the present features of the metal working trades. While this is gradually stimulating domestic activity, the exceptionally high prices of material and labor prevent any great development in that direction. The producing end of the steel industry exhibits unceasing energy, although the market is comparatively quiet, pointing to some slight relief in certain quarters. The metal market conditions continue quiet, quotations for most metals showing a declining tendency.

Pig Iron

The pig iron situation is unchanged; capacity production still prevails, and the demand for steel making pig continues to be greater than the supply.

Steel

While price advances are not so pronounced as a few weeks ago, the strength of the market does not indicate any tendency to weaken; in fact, any change will likely be upward instead of downward. Pittsburg reports an advance of $5 per ton on rivets, and a rise of from 5 to 10 per cent. on nuts and bolts. Deliveries on billets and sheet bars are better. The demands on the plate mills continue heavy, and car builders and shipyards are experiencing great difficulty in securing sufficient material for their requirements. The mills are still

Lead.—In the absence of the usual demand for lead, the situation has become somewhat quiet, and prevailing conditions show an easier tone than a few weeks back. London markets are quiet, and prices are easier, £31 5s. being asked for spot and £31 10s. for futures. Local dealers report fair business, with general conditions unchanged and prices firm at 9¼ cents per pound.

Antimony.—The apparent scarcity of a few weeks ago has now changed into one where the supply is greater than the demand. During the past two weeks New York has declined 10 cents, the present quotation being 26 cents per pound and further reductions are expected. Local dealers report a weak market on declining prices; a drop of 4 cents during the week placing current quotations at 38 cents per pound.

Aluminum.—General market conditions in aluminum are unchanged. It is reported that some business is being done by regular customers at about 35 cents per pound for next year's delivery. Local prices are nominal at 68 cents per pound.

Machine Tools and Supplies

The conditions are gradually assuming more normal proportions, as the demand for war machinery is constantly decreasing. Inquiries for single tools or small lots are still being made, but complete equipments for munition making are no longer required. Deliveries on certain tools are still delayed, and in some instances months must elapse before delivery. Domestic trade has greatly benefited, indirectly from war conditions, as many lines of industry have been added to, and new ones developed, resulting in considerable machine equipment being required.

Old Materials

General decline in all metal scrap is reported, and dealer's business is very brisk. Copper scrap has declined 1 cent all round. Machine compositions on a decline of 1 cent are quoted at 16 cents. A similar reduction puts turnings at 13¾ cents, and brass clippings are now 15¼ cents. Old lead is weaker by one-half cent, heavy being quoted at 6½ and tea at 5¾ cents. Scrap zinc is quoted at 12½ cents, showing a decline of 2 cents. Other scraps are unchanged, but with a weaker tendency.

Toronto, Ont., May 30.—Business continues active, being considerably better than last year around the corresponding period. The outlook as far as demand is concerned is bright but as regards production the situation is not so favorable. The difficulties that are being experienced in getting raw materials and the scarcity of labour due to enlistments are already tending to curtail production. For these reasons and also because of the increased cost of raw materials, high prices on all kinds of machinery and products composed of iron or steel will obtain for some time to come.

It is understood that further contracts for 8 in. and 9.2 in., shells have recently been placed in Canada and as a result enquiries for large-swing lathes have been sent out. The machine tool makers are very busy and the trade is in a prosperous condition. There are some price changes to note in the steel market affecting steel bars and boiler tubes, advances being registered in both cases. The ingot metal markets are weaker throughout the list and all metals are lower with the exception of lead which is unchanged.

Steel Market

Although there is still a tendency towards higher prices for steel products, there are indications that the market is reaching the high water mark. There is, however, no falling off in demand and deliveries are, if anything, getting more backward. There is, therefore ,little probability of any pronounced weakness developing in the market for some time to come and prices, no doubt, will be maintained at a high level for the rest of the year. The steel market in the United States is steadier and if this condition is maintained, the effect is bound to be felt in Canada. The principle price changes this week include steel bars which have advanced 25c and are now quoted at $3.25 per 100 lbs. base. Even at this price they are lower than Pittsburgh bars would be laid down here; the inference is that there may be a further advance at no distant date. Another advance in lapwelded boiler tubes has been made, and still higher prices are quite possible. The output of iron and steel boiler tubes at present is exceptionally heavy and the mills are backward in deliveries. Prices on wrought iron pipe are unchanged but an advance is expected any time on account of the skelp situation. Skelp mills are filled with orders for four or five months ahead and are not taking new orders. Boiler plates are very firm at last week's advance and deliveries are running into six to eight weeks.

The market for sheets continues strong and prices are being well held. Deliveries from most sheet mills are running into the latter part of the third quarter while production is being delayed owing to the insufficient supply of sheet bars, and delays in deliveries from the steel mills. The market for galvanized sheets is steady and the situation generally unchanged. Although spelter has declined, the price is not low enough to materially benefit the galvanizing trade.

The steel market in the United States continues strong at current quotations and specifications-against-contract continue in large volume. New business is being offered to the mills for the second quarter of 1917, which is an indication that the demand for steel is not falling off very much. Prices are firm and steady, and the opinion is generally held that the top has been reached but no marked decline is expected for some considerable time. Steel bars are unchanged at 3c, plates 3.75c and shapes 2.60c Pittsburgh.

Pig Iron

The market continues strong and quotations firm but unchanged. Foundries are buying carefully but the tonnage is increasing. The importations of pig iron from Great Britain are increasing in volume, the tonnages for April being valued at about $123,168 as against $24,000 for the corresponding month of last year.

Old Materials

There is nothing of particular interest to note in the scrap market. The situation is generally much the same as during the past few weeks. Quotations on copper and brass are a shade weaker, otherwise prices are unchanged. There is a fair demand generally for old materials and the market is steady.

Machine Tools

There is a better tone to the market this week due to some good enquiries which have been received by dealers for lathes for machining 8 in. and 9.2 in. shells. These are mostly of the single purpose type and as deliveries can be made promptly, some attractive business is expected. An interesting development in the trade is the purchase of a site at West Toronto, by the Russell Motor Co., who propose establishing a plant there for making bicycles and skates. Deliveries of standard machine tools are somewhat easier to obtain though it is still necessary to wait several months for some types.

Supplies

Business continues active and prices are still very firm. There have been

---

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

comparatively few price changes this week, the more important being on linseed oil and turpentine which have both declined. The oil market is weak on account of very light demand, the price quoted now being 82c for raw, and 85c for boiled oil. Turpentine is being quoted at 68c per Imperial gallon

Metal Market

The metal markets are dull and prices in many cases have declined. One of the reasons for the easier tendency in most metals, with the single exception of copper, is that production has been increased to a degree equal to the present demand. The dullness in copper is a result of the buying movement having been succeeded by a period of inaction, the position of this metal is nevertheless, a strong one. The tin market has been influenced by the weakness in other metals and has declined. The spelter market is very weak and lower on light demand. The "Trust" price for lead is unchanged but the outside market is a shade lower than it was last week. Antimony and aluminum are weak and quotations are lower. Solders are unchanged but have a weaker tendency.

Copper.—The market has declined in London owing to a recent Government order which prohibits speculative trading in copper on the London Metal Exchange after May 31. The New York market is steady but dull at unchanged prices. The buying movement in copper appears to have come to an end for the time being and the market is, therefore, less active and easier. The position of copper is as strong as ever and a recovery may be looked for. Copper has declined ½c locally and quotations are nominal at 31½c per pound

Tin.—The market is weak and lower for spot tin due to an increase in visible supplies and falling off in demand. The market for futures is firmer and quotations unchanged. Tin has declined 2c and quotations are nominal at 52c per pound.

Spelter.—The market is lower both in London and New York. The demand for spelter is very light and price recessions are being made each day. Spelter has declined 2c and is now being quoted at 19c per pound.

Lead.—The demand for lead is light and the market has a weak tendency. The "Trust" price is unchanged at 7.50c New York but the outside market is lower. Prices in the outside market are being established by second hands, who are offering small tonnages at concessions. Lead is unchanged locally at 9½c per pound

Antimony.—The market is neglected and buyers show no interest despite reduced prices. Quotations are lower and nominal at 42c per pound.

Aluminum.—The market is weak and lower, and, while the demand is somewhat better, the supply is larger. Aluminum has declined 2c and is now quoted at 66c per pound.

OUR NEED OF AN OCEAN MARINE

IN an article on "Canada's Need. A Great Ocean Marine," in the second number of Canada Steamship Lines' new monthly publication. The By-Water Magazine, Roy M. Wolvin, of Winnipeg, discusses one opportunity that exists for keeping in Canada money that is now being diverted abroad. He says in part:

"I will only speak of the grain grown in our great western provinces and shipped through the ports of Port Arthur and Fort William to lake ports in the United States for furtherance by rail to United States seaboard and thence by vessel to foreign buyers. In the figures I have prepared I will not include our grain moving all rail through the United States or that shipped by lake from the ports of Duluth and Superior.

"Of our 1915 wheat, oats and barley crop, there was shipped by water to U. S. lake ports during the fall navigation period only of 1915, the following:

98,346,404 bushels of wheat
3,646,844 bushels of oats.
1,836,263 bushels of barley.

103,829,511 bushels of grain (excluding flax).

"The average lake rate which this grain paid to United States vessels was about four cents per bushel on wheat and barley, and three and one-quarter cents on oats, making a total contribution to the United States for its lake sailors and lake vessels of about $4,125,828. The railroad rates at and east of Buffalo to New York for export are: Wheat, six cents per bushel; barley, five and one-quarter cents per bushel, and oats, four cents per bushel. Using this rate as applying on all this grain, we find we have made our little contribution in cash to the United States railroads and railroad employees of about $6,143,061.

"The charges at New York on this grain for loading full cargoes are one-half cent per bushel, and for floating to steamers which do not come to elevattors nine-tenths of a cent per bushel. Using the full cargo basis, we find we contributed to the elevator facilities in Atlantic ports of the United States $519,147.

"To move this grain from U.S. ports to foreign purchasers undoubtedly required 500 steamers, each of which in stevedoring charges, supplies purchased, and repairs made, would average a cash outlay in port of $1,200 or a total of about $600,000.

"So we find that we have calmly turned over in cash to our neighbors to the south:

Lake vessels	$4,125,828.00
Railroads	6,143,061.81
Port charges	519,147.06
Ocean vessel port disbursements	600,000.00
	$11,388,036.87

"Present indications are that the wheat, oats and barley now in our western provinces, the remainder of our wonderful 1915 crop, will contribute just about the same number of dollars to the United States, making a grand total from the 1915 crop of about $23,000,000. This 'real money' can be retained in Canada only by the greatest protection to her lake vessels, increased railroad and ocean port facilities, and an assured supply of ocean vessels trading from Canada. Our statesmen at Ottawa are keenly alive to this loss which we are suffering every day, and I feel sure will develop our Eastern Canadian facilities so as to properly care for this great tonnage of grain from the west and will make every effort to the end that Canada may have a proper supply of her own ocean tonnage. I can go further and dream of the not far distant day when this grain on the ocean will be carried in Canadian owned and Canadian manned vessels, built in Canadian shipyards. This will turn into the coffers of Canada the ocean freights now being paid to others and we shall then retain the full price of the grain instead of so gracefully donating such a large proportion to others."

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian.—Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

ICE-BREAKER "J. D. HAZEN" SOLD

AS forecasted in the speech of the Prime Minister at the launch of the St. Lawrence ice-breaker, J. D. Hazen, that vessel has, we understand, now been sold to the Russian Government. It will be completed during the coming fall, and, it is hoped, will be delivered in time to aid in the work of keeping open Russia's winter port of Archangel.

This is the third Canadian vessel of the kind to be turned over by the Government to the Czar's Empire during the last two years. The Minto and the Earl Grey have been similarly disposed of, and have been sent across the seas to enter the service of Britain's Ally. They have already done splendid work, and in the expression of the Russian Government's gratitude for the transfer of the vessels it was emphasized that they have paid for their value many times over in the facilities they have afforded for the landing of cargoes of munitions at Russia's White Sea port. The Minto and Earl Grey were small vessels, however, compared with the J. D. Hazen. It is understood that certain changes in construction will be made to meet the wishes of the Russian authorities before being turned over to them, which will enable the vessel to be used for the carrying a certain number of passengers, as well as being used for ice-breaking purposes proper.

Control of Empire Metal Industry.—The Prime Minister of Australia, stated, at a recent interview, that he was hopeful of reaching an early solution of the zinc problem by an arrangement which would enable the whole of Britain's spelter requirements to be manufactured in the Commonwealth. This would destroy the German influence, and control over the spelter trade, and establish on sound business lines a truly Imperial scheme of industry. As a result of his negotiations with leading British representatives of the metal industry, Mr. Hughes expects shortly to be able to put the matter before the Imperial Government in a definite form.

TRADE WITH GREAT BRITAIN

THE following are the figures for the trade between Great Britain and Canada in the undermentioned articles during April:

	April, 1915.	April, 1916.
Exports from Canada:		
Wheat	£651,467	£1,009,496
Wheatmeal	164,821	376,904
Barley	299	110,409
Oats	23,242	169
Bacon	318,745	466,339
Cheese	15,687	45,960
Eggs	1,092	1,163
Canned salmon	118,913	199,796
Canned lobsters	12,830	5,504
Fir	137,339	70,195
Imports to Canada:		
Spirits	27,213	46,125
Wool	43,795	46 269
Pig iron	6,828	25,384
Galvanized sheets	4,389	4,960
Steel bars	5,003	20,569
Pig lead	815	1,210
Tin, unwrought	27,883	16,924
Cutlery	5,330	5,976
Hardware	3,660	4,343

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Toronto, Ont.—The Sheet Metal Products Co., will build an addition to their plant to cost about $6,000.

Alliston, Ont.—The Benedict-Proctor Mfg. Co. are in the market for a 50 h.p. engine and boiler.

Welland, Ont.—The Dominion Incinerator Co. has purchased a site here, and will erect an incinerator.

Montreal, Que.—The Canada Stove Co. will build an extension to their factory at St. Laurent near here.

Montreal, Que.—The Canadian Tube & Iron Co. have commenced the erection of a factory, estimated to cost $3,000.

Renfrew, Ont.—The Renfrew Electric Mfg. Co. have commenced the erection of an addition to their premises, estimated cost of $5,000.

Trenton, Ont.—It is reported that the Canadian Sprayer Co. will build a plant here for making sprayers and gasoline engines.

Weston, Ont.—The Russell Motor Car Co. have purchased a large block of land from the Chew Estate, and will immediately erect a big plant, which will be used in the manufacture of skates and bicycles.

Montreal, Que.—The Canadian Cotton Co. will instal a large motor generator in the mill at Cornwall, Ont. R. S. Kelsch, consulting engineer, Power Building, Montreal, has the matter in hand.

Hamilton, Ont.—The Dominion Sheet Metal Co. is adding two buildings to its plant—one 20 ft. x 100 ft., for storing metals and by-products, and one 40 ft. x 80 ft., for additional black sheet storage.

Montreal, Que.—It is reported that the Du Pont Powder Co. has organized a $10,000,000 subsidiary company, which will operate exclusively in Canada. The company has secured a water power and other properties on the Saguenay River, and intends commencing construction at an early date.

Kingston, Ont.—The plant of the North American Smelting Co. has been rented by a Toronto firm, of whom J. Mercer is a representative. The plant is being overhauled and the operations of smelting lead are to be commenced in a very short time.

The Waldon Co., with offices at Winnipeg, Montreal, and Toronto, are now manufacturing their Spencer boilers at Penetanguishene, Ont. Heretofore these boilers were made in the United States. The company's business has grown to such an extent that it has become necessary to establish a Canadian plant.

Welland, Ont.—Further extensions will be made to the plant of the Canada Forge Co., to cost $50,000. The present addition is to be a steel and brick building, 60 x 227 ft., with crane runway extension, 150 ft. long, equipped with electric cranes and loading rack for the inspection and shipment of shells.

Municipal

Simcoe, Ont—The ratepayers on May 22 voted in favor of a by-law to loan $20,000 to the Unique Shoe Co.

Ingersoll, Ont.—The town council will proceed with the installation of the proposed new street lighting system.

St. John, N.B.—The city council contemplate extensions to the waterworks system, at an approximate cost of $230,000.

Hull, Que.—It is proposed to spend $146,000 on extensions to the waterworks, electric light and fire alarm systems. A by-law will be voted on to authorize the expenditure.

Simcoe, Ont.—The shoe factory bylaw passed by a substantial majority here on May 22. It is expected that building operations will be started shortly.

Toronto, Ont.—The Board of Control has recommended that the contract for the erection of a new car barn on St. Clair Avenue be awarded to R. Chalkley & Sons, the lowest tenderers, whose price is $24,435.

Niagara Falls, Ont.—The Stamford Township Council has adopted a resolution favoring the plan of the Ontario Hydro-Electric Commission to purchase the plant and lines of the Ontario Distributing Co. for $29,000. A by-law will be voted on to raise the necessary funds.

Sarnia, Ont.—A letter has been received in the city from the Provincial Board of Health recommending that a 30-in. pipe be laid under the bed of the river to a point 200 feet from the shore, where a crib will be erected about 4 feet above the bottom of the river. The water at this point is about 40 feet in depth and the pipe would not be interfered with by the ice in winter. An automatic chlorine machine will have to be installed to purify the water.

General Industrial

Harrow, Ont.—The W. Clark Co., of Montreal, will build a canning factory here.

Ottawa, Ont.—Grant, Holden & Graham will build a factory here to cost about $30,000.

Toronto, Ont.—The William Davies Co. have purchased the Taylor Soap Works, which will be equipped and used as a beef house.

Elmira, Ont.—The machinery for the new knitting factory to be established here will arrive in a few days, and will be installed in the Elmira Felt Co. premises.

Gananoque, Ont.—A sawmill and cheese factory owned and managed by Charles Wilcox, at McIntosh Mills, was totally destroyed by fire recently. There was no insurance.

Vancouver, B.C.—Fire on May 29 partly destroyed the plant of the New England Fish Co. and the Alberta-Pacific Grain Elevator here. The loss is estimated at $600,000. No lives were lost.

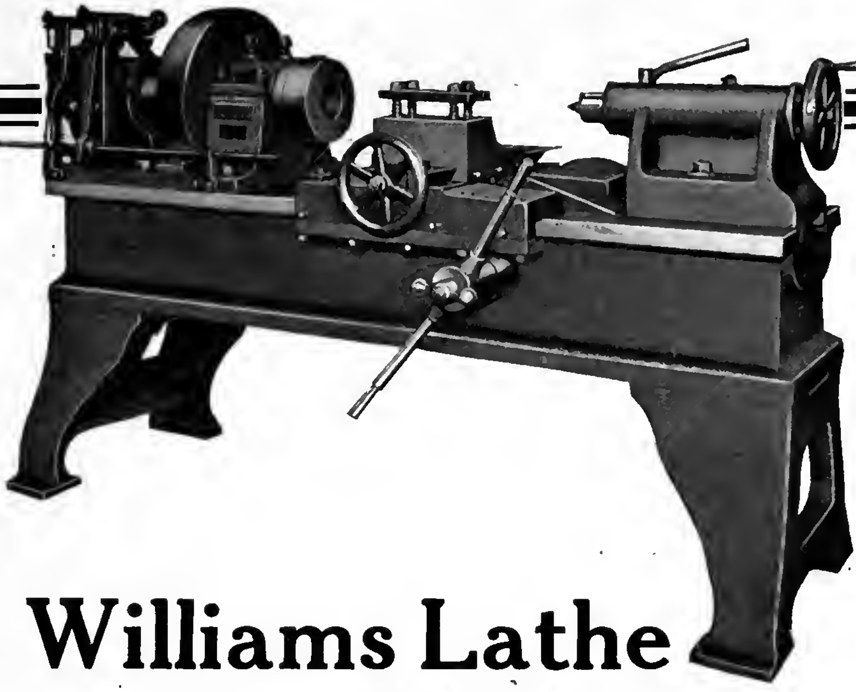
Saskatoon, Sask.—An effort is being made by the Board of Trade to induce the Lake of the Woods Milling Co. to build a mill here to replace the plant recently destroyed by fire at Medicine Hat.

Barrie, Ont.—Messrs. Brown and Morden, representing a company that is being organized to manufacture condensed milk, are negotiating with the Board of Trade regarding the installation of a factory here.

Markham, Ont.—The Purvis Salts Co., which has been incorporated recently with a capital of $40,000, will erect a factory here for making health salts and mineral waters. A. W. Burk, of Toronto, is president of the company.

Tilbury, Ont.—The F. S. Carr Rubber Co., which has been operating here for about four years, is moving its business to Granby, Que., where they have purchased the factory and equipment formerly operated by the Walpole Rubber Co. in that town.

Boring — Turning



The A. R. Williams Machinery Co., Ltd.

64-66 Front Street W. Toronto, - Ontario

SPECIFICATIONS

Length of bed ......8' 6"
Width of bed ....19½"
Depth of bed ....13"
Swings over bed.......19"
Length of saddle ....34½"
Feeds..1-16", ⅛" and 3-16"
Takes between centre 4' 2"
Pilot wheels geared 4 to 1.
Ball thrust throughout.
Front Bearing of Spindle (6" shell), 8 3-16" x 7½", Bored 6⅛".

SPECIFICATIONS

Front Bearing of Spindle (4.5" shells), 6½" x 7½", Bored 4 19-32" dia.
Rear Bearing of Spindle, 5¾" x 7½".
Flange on Front of Spindle, 12" dia.
Size of Driving Pulley. 13" x 8" face.
Dia. of Turret (6 holes for bars 3" to 3¾" dia.), 20".

Williams Lathe

For Boring 4.5" and 6" Shells

A machine must have passed a 100% efficiency test to have our mark beside it. We could not afford to risk our reputation as Canada's Leading Machinery House to put before the public a machine of inferior quality. A careful study of the illustration and specifications will reveal to you a machine of great strength and durability. Write us for full description and prices.

NO SCREW-CUTTING TOOL CAN BE SUCCESSFULLY OPERATED

Without Proper Grinding or Sharpening

THE GEOMETRIC CHASER OR DIE GRINDER

is a machine carefully designed and constructed for the correct grinding of thread chasers and dies.

Its use is economy where threading tools are employed.

It not only keeps all the chasers of a set in condition for perfect work, but at the same time prevents excessive wear on one or two of the chasers.

THE GEOMETRIC grinds any make of thread chaser, whether of a stock or special type. Also fitted with a second grinding wheel for ordinary tool grinding.

SEND FOR DESCRIPTIVE BOOKLET.

The GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U.S.A.

CANADIAN AGENTS: Williams & Wilson, Limited, Montreal; The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg, St. John, N.B.

Collingwood, Ont.—A recently organized syndicate propose establishing a factory here for making wood and metal specialties. The promoters are asking the town for a loan of $15,000. F. Kent and J. A. Sinclair, of the Seamen Kent Co., are interested in the proposition.

Sarnia, Ont.—A representative of a concern capitalized at $10,000,000, whose name has been withheld, is in Lambton district with the idea of erecting a sugar beet factory. The concern has heard of the excellent results which have been produced in this part of Western Ontario, and is fully investigating conditions.

Campbellford, Ont. — The by-law authorizing a loan to the Northumberland Paper & Electric Co. of this town of the sum of $30,000 to assist it in the rebuilding of its paper mills recently destroyed by fire, was carried on May 22. The company is proceeding with the erection of a much larger plant than their former one.

Contracts Awarded

Galt, Ont.—The Hamilton Bridge Works have the contract for the steel work for the extensions to the Goldie & McCulloch Co. plant.

St. John, N.B.—The Nova Scotia Construction Co. has been awarded the contract for the construction of the portion of the Valley Railway from Gagetown to Westfield, a distance of 40 miles.

St. Catharines, Ont.—Sherwood & Sherwood, Mail Building, Toronto, have received the contract for the erection of a plant for the McKinnon Dash & Hardware Co. here, at a cost of $75,000.

Tenders

Toronto, Ont.—Tenders for light fixtures for the new Registry Office will be received up to 6th June, 1916. Plans and specifications may be seen and forms of tender obtained at the office of the city architect, City Hall, Toronto.

Toronto, Ont.—Tenders will be received at the Department of Public highways of the Province of Ontario up to June 9, for the supplying of motor vehicle markers required for the year 1917. Specifications and forms for tender may be obtained from W. A. McLean, Deputy Minister of Highways.

Toronto, Ont.—Tenders will be received by the Chairman, Board of Control, City Hall, up to June 6, for the supply and delivery of coal meters for measuring coal at Main and High Level Pumping Stations. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Winnipeg, Man.—Tenders will be received at the office of the Board of Control, up to June 5, for the supply of one combination gasoline pumping engine and hose wagon, with a pumping capacity of 700 gallons per minute, and capable of carrying 1,000 feet of 2½ inch fire hose. Form of tender may be obtained at the office of the chief of the fire department, Central Fire Station.

Building Notes

Toronto, Ont.—The T. Eaton Co. have been granted a permit to erect a twelve-storey manufacturing building on the corner of Alice street and Downey's Lane at an estimated cost of $625,000.

Ottawa, Ont.—The Mint at Ottawa is to be extended and enlarged in its operations. It is understood that this extension will be of a temporary character, but of considerable magnitude. The work is to be got under way at the earliest moment possible. The new building will be built in close proximity to the permanent structures.

Ottawa, Ont.—The restoration of the Federal Parliament Buildings is to be done partly on the percentage basis and partly by contracts based on competitive tenders. An arrangement has been made with the Peter Lyall Construction Co., Montreal, which cleared away the debris, to reconstruct the main walls of the building, and do certain other work the total estimate of which is around two million dollars. The company will be paid 8 per cent. on the actual cost of the operation. For the inside of the building, such as the construction of the chambers, plumbing, heating, painting and decoration, competitive bids will be asked. The arrangements are in the hands of a joint committee of Parliament, representing both Houses.

Personal

A. F. Macallum, for seven years city engineer of Hamilton, Ont., has been appointed Commissioner of Works of the city of Ottawa, Ont.

J. E. B. Phelps, former chief engineer of the Sarnia Electric Light Co., has been appointed general manager of the Sarnia Hydro-Electric Commission.

Col. Noel Marshall, president of the Standard Fuel Co., Toronto, and of the Canadian Red Cross, has arrived in London, England, in the interests of the Society.

Lieut. W. Roy Russell, of the 168th Battalion and recently with the John Morrow Screw & Nut Co., Ingersoll, Ont., was recently presented with a pair of .45 Colt automatic pistols by the members of the staff. President J. Anderson Coulter made the presentation..

Hon. R. H. Brand has been appointed an additional member of the Imperial Munitions Board to act as its representative in London. Mr. Brand same out to Canada last fall with Lionel Hichens, and assisted in the reorganization of the Shell Committee as the Imperial Munitions Board.

Major Norman C. Pilcher, formerly general manager of the Sherbrooke Railway & Power Co., has been killed in action in Flanders while serving with the Canadian Mounted Rifles. Major Pilcher was born in England 36 years ago, but had lived in Canada for 24 years. He went to South Africa with the Canadian contingent during the Boer War. On returning to Canada, he was for a time manager of the Fort William Tramways, coming from that city to take the post in Sherbrooke, which he held until leaving for the front.

Wood-Working

Ocean Falls, B.C.—Work will begin shortly on the construction of a lumber mill for the Pacific Mills.

Elmira, Ont.—The erection of the new planing mill is well under way. The building, 70 by 90 feet, is partly up, being concrete, with walls 14 feet high. The interior will be fitted up with modern and up-to-date machinery.

Marine

Commander D. Dow, late captain of the Cunarder Lusitania, is at present visiting his brother in Thamesville, Ont. He will be in Toronto later, and will be the guest of Sir William Mulock.

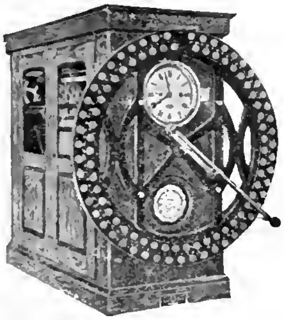
Vancouver, B.C.—The first steel, ocean-going cargo steamer to be constructed in British Columbia will be built at the Wallace Shipyards, North Vancouver. Work will be commenced at the end of June or beginning of July, and the vessel is to be delivered early next year. The steamer is for the firm of Dingwall, Cotts & Co., Pacific Building, Vancouver, and also of London, England, who, through their Vancouver manager, John Eadie, placed the contract and signed it up. The steamer to be built will be 315 feet long and 45 feet beam. She will have a carrying capacity of 5,000 tons and a speed of nine and a half knots. The plans show her to be a single deck, single screw steamer, with two boilers, triple-expansion engines, eight

Here's the way to save a year's dividends

You have competitors? Yes! Look around and you'll see they use International Time Recorders. That's why they are SUCH competitors.

There's no argument about "working time" being the greatest of all raw materials you buy, yet many manufacturers permit four leaks a day in the supply every man on their pay-roll sells them.

"Walking time"—there's the biggest leak. The time the employees take *after* ringing in on the Recorder and *before* they get to work.



Check this loss. Put an International Time Recorder at the door of each department. Then it's up to the foreman to see that every man is busy at his bench or machine—and he'll do it.

Our big, new Canadian factory is prepared to make a Time Recording system to exactly suit any business—even yours.

Prices and new literature on request. Write to-day for it. No time like the present to start saving money.

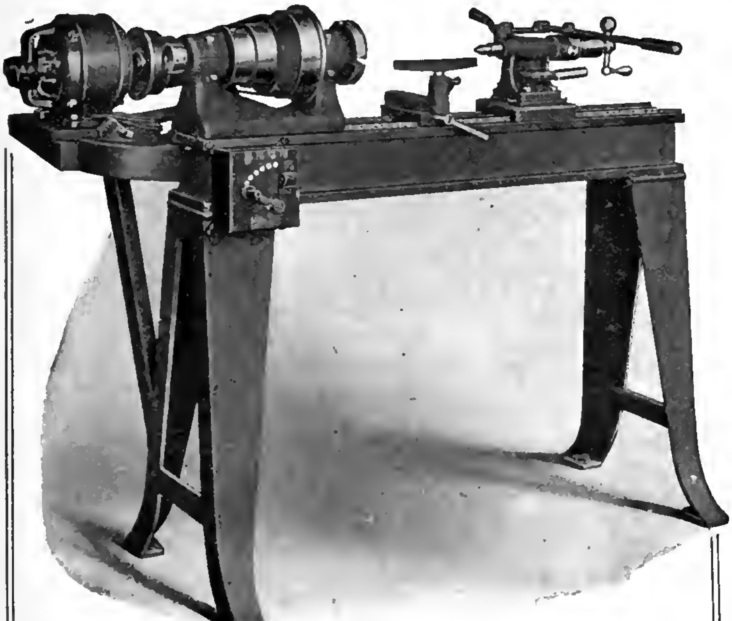
INTERNATIONAL TIME SYSTEMS

International Time Recording Co. of Canada, Ltd.

TORONTO: ANDERSON STREET, F. E. MUTTON, Manager

Phones:—Office, C. 7393; Service Dept. C. 7372

MONTREAL: W. A. WOOD, Sales Agent, Corner McGILL and CARTIER STREETS



Motor Driven Speed Lathe

This style of motor drive employs a constant speed motor mounted on a plate having an extension arm to support a bearing for the outer end of the motor shaft. The motor plate is fitted to a slide on a shelf which is securely fastened to the back of the lathe bed. The motor plate is moved by means of a screw which tightens or loosens the belt. A four-step cone pulley on the motor shaft is belted to a four-step cone pulley on the spindle. This gives the same speed variation as when a countershaft is used, and by means of various size cones on the motor a wide range of speeds are obtainable.

The lathe spindle is made from high carbon steel, ground to size, and running in self-oiling bronze bearings. The tailstock has screw and lever feed. The bed is crossed-braced and all clamping levers are above the ways.

J. G. BLOUNT CO. - Everett, Mass., U.S.A.

GET YOURS

If you do—or intend to do Tumbling you should have this practical treatise.

It is the result of ten years' experience with Tumbling methods and barrels—and contains many helpful hints.

The man responsible for results in your Tumbling Room may find it instructive.

Your **free** copy is awaiting your call. Mention Canadian Machinery.

THE GLOBE MACHINE & STAMPING CO.

CLEVELAND, OHIO

winches, and four big hatches. She will be built to Lloyd's highest classification under special survey. The vessel will have four watertight bulkheads, and wood for hull and deck will be British Columbia fir.

Trade Gossip

The Fisher Motor Co., the E. Long Mfg. Co., and J. R. Eaton & Sons, all of Orillia, Ont., have joined in presenting the 177th Battalion with a motor truck. The truck will be built by the first-named firm.

Port Arthur, Ont.—The "Bull" tractor, which is a product of the Western Dry Dock & Shipbuilding Co. plant, Port Arthur, and was recently placed on the Western market, can now be operated by either gasoline or kerosene. This is expected to prove a great advantage to manufacturers and to farmers, on account of the desirability of using kerosene instead of gasoline, which has advanced enormously since the beginning of the war.

M. Beatty & Sons, Welland, Ont., have received an order for a complete coal handling outfit consisting of steel derdick, triple drum, electric hoist and clamshell bucket from the Canada Glue Co. of Brantford, Ont.; also an order from the Northern Canada Power Co. for hoisting engine, boom swinger and steel stone skips for use on the enlargement of the hydro-electric project near Timmins, Ont.

Canned Goods Embargo Raised—The Dominion Government has been informed that the embargo, placed by the Imperial Government on imports of canned fruits, vegetables, etc., has been raised, in so far as it affects these imports from British Dominions. The question is of considerable importance both to the producers and canners in this country, and has been the subject of numerous inquiries since the original order was promulgated.

British Industries Fair. — In consequence of the satisfactory results achieved by the two British Industries Fairs already held, the Board of Trade propose to organize a similar fair in London next year (1917), from Monday, February 26, to Friday, March 9, inclusive. Full particulars will be announced in due course. Participation will again be confined to manufacturers, and admission (by invitation) to wholesale buyers.

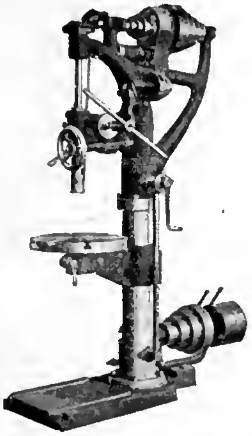
Motors Cars Cost More.—Materials which enter into the construction of automobiles since the war began have increased as follows:—Steel, $29 a ton to $60; copper, 13 cents to 30 cents; brass, 13 cents to 36 cents; aluminum, 20 cents to 65 cents; skilled labor, 20 per cent. It is understood that manufacturers expect to overcome this by advances of $50 to $300 per car, provided gasoline does not rise further and cut down the number of car buyers.

Ottawa, Ont.—Plans and specifications are being prepared here for a flax mill, costing $10,000, to be used entirely for experimental purposes. The new mill, according to G. G. Bramhill, Dominion flax official, will be modern in every way. The latest machinery necessary for the manufacture and improvement of flax fibre will be installed and many of the machines used in European countries will be secured. The object of erecting this mill is to locate in Canada the best districts adapted to flax growing.

Orillia, Ont.—The rejection of the Hydro agreement involves the town in further capital expenditure of $80,000 to instal machinery in the new power house at Swift Rapids. The present plant at Ragged Rapids generates 1,700 h.p., which is inadequate to the town's requirements, and some 500 h.p. is taken from the Hydro at its big chute plant. The town's new equipment at Swift Rapids will consist of two units of 1,600 h.p. each, and provision is made for installation of additional units up to 6,000 h.p., so that by retaining and operating its own generating plant Orillia will have ample power for its requirements for many years to come.

Prospecting for Natural Salts.—New regulations have been established by the Dominion Government to cover prospecting for salts of potassium in the region of the Peace, Athabasca and Mackenzie Rivers. It has been represented to the Interior Department that there is a strong possibility of discovering such minerals in this district and owing to the great demand for them for fertilizing purposes, and the fact that the present production is quite insufficient to satisfy the world's requirements, it has been considered advisable to make more favorable regulations. Prospecting for such minerals involves considerable expenditure and it has accordingly been provided that in the four Western Provinces and the North-West Territories rights to such minerals may be leased at a rental of 25 cents per acre for the first year and 50 cents per acre for the second year.

New Foundry Equipment Firm.—Leyshon & Lane, Incorporated, Detroit, Michigan, is a new company organized to take over the oven and special foundry equipment business which has grown out of H. M. Lane's foundry research work. The H. M. Lane Co. was organized some years ago to do foundry consulting work and to design new foundries. It was not the intention to make it a contracting or manufacturing organization, but various devices and



Standard 20-inch Drill Press

The Canadian Standard 20-inch Drill Press can be used for the various operations of reaming, sizing, centering, tapping, etc., on high explosive shells. It is adapted to meet the severe demands of shell manufacturers, and is fulfilling all requirements for specialized work.

Write for full particulars

Canadian Blower & Forge Co.
Limited
BERLIN, CANADA

Montreal Toronto Winnipeg Vancouver St. John

THE IMPROVED TAYLOR-NEWBOLD

INSERTED TOOTH COLD SAW

Write for Bulletin T-S

Tabor Mfg. Co., Philadelphia, U.S.A.

GARLOCK-WALKER MACHINERY CO. LIMITED

G&W MACHINERY

32 FRONT ST. WEST, **TORONTO** TELEPHONE MAIN 5246

Lodge & Shipley Tool Room Lathes

We have for shipment this month, several 20" L. & S. Double Back Geared, quick change gear, tool room lathes; taper attachments and relieving attachments if desired.

ALSO

Single Purpose Turret and Turning Lathes—
Cutting-off Machines

Write us for prices and deliveries on anything in the way of Iron or Wood Working Tools.

GARLOCK-WALKER MACHINERY CO., Limited, Telephone Main 5346 32 Front St. West, TORONTO

Canadian Representatives for: American Wood Working Machinery Co., Rochester, N.Y.
Lodge & Shipley Mach. Tool Co., Cincinnati, Ohio. M. L. Andrews Co., Cincinnati, Ohio.

METAL and WOODWORKING MACHINERY of all Kinds

equipment were developed, some of them being patented by H. M. Lane, particularly the forced draft core and mold oven system. Leyshorn & Lane, Inc., will contract for complete foundry installations, melting furnaces, annealing ovens, core ovens, mold ovens, and handling appliances. T. A. Leyshon, associated with H. M. Lane for several years, is president, and C. T. Holcroft, who has been enaged in furnace building for many years, is treasurer. The new company has made arrangements for a portion of H. M. Lane's time as consulting engineer. The H. M. Lane Co. will continue as a consulting organization.

New Incorporations

The Arnot Construction Co. has been incorporated at Toronto, with a capital of $40,000, to construct railways, tramways, docks, canals, etc. Head office to be situated at Toronto. Incorporators: D. Arnot, O. Rouse, and T. H. Peine, all of Toronto.

The Electric Fittings & Foundry has been incorporated at Toronto, with a capital of $48,000, to manufacture electrical machinery of all kinds. Head office to be situated at Preston, Ont. Incorporated by F. Charles O'Leary, of Toronto.

The Sure-Shot Mfg. Co. has been incorporated at Toronto, with a capital of $40,000, to manufacture polishes and cleansing materials, at Pembroke, Ont. Incorporators: G. A. Herron, of Westmeath, and F. W. Cockburn, of Pembroke, Ont.

Catalogues

Electric Motors.—Bulletin 102X published by the C & C Electric & Mfg. Co., Garwood, N.J., describes fully a motor which has recently been placed on the market. The motor is known as the "IB" type and is specially designed for direct connection to machine tools, fans and general industrial machinery. The principal features embodied in the design of the motor are described in detail while numerous illustrations give a general idea of the construction. Copies of this bulletin will be sent on request.

Direct Current Motors.—The C. & C. Electric Co., of Garwood, N.J., have published a bulletin, presenting their well-known direct current motor, known as the "Old Reliable." These motors are of the four-pole, interpole type, built in sizes from 1 to 125 h.p. The bulletin illustrates and describes the details of construction of the parts and contains a complete table of adjustable and constant speed ratings, with full dimensions of all frames.

Oil Filters.—Bulletin No. 5, recently issued by the Richardson-Phenix Co., Milwaukee, Wis., describes a complete line of filters for purifying lubricating oil, having capacities of from 25 gallons per day to 50,000 gallons per hour. This is a most complete oil filter catalogue and describes some exceedingly interesting large size filters for use in purifying lubricating oil from water wheel thrust

bearings, large gas and steam engines in steel mills, and also for purifying cutting lubricants. The catalogue serves to indicate the remarkable advance made in recent years in the science of oil filtration, and shows how scientific principles are employed in the small as well as the large size filters. The catalogue is profusely illustrated and contains prices on the various size filters. Copies may be had by addressing the company as above.

Iron and Iron-Carbon Alloys.—Bulletin No. 266 of the Scientific Papers of the Bureau of Standards, by Messrs. Cain, Schramm, and Cleaves, deals with the preparation of pure iron and iron-carbon alloys. The authors have worked out methods of producing laboratory samples of iron-carbon alloys of a very high degree of purity; sources of contamination of melts and means of eliminating them are described; a method of preparing magnesia of a satisfactory degree of purity for making crucibles to be used in work of this kind has been developed; and a procedure for making small ingots, which are sound and free from blowholes, without the use of deoxidizers, has been worked out. A series of iron-carbon alloys containing 99.96 per cent. of the two elements has been prepared to serve as a basis for the re-determination of the iron-carbon equilibrium diagram.

Book Review

American Handbook for Russia.—The American-Russian Chamber of Commerce, 60 Broadway, New York, of which E. C. Porter is secretary, has decided to prepare for exclusive distribution in Russia a handbook on American financial and commercial conditions, and containing a directory of selected American business houses. Hitherto American business firms have been unable to establish direct contact with Russian distributors and consumers, and Russian firms have had no means of developing direct connections with American business houses. The book, which will be printed entirely in Russian, will devote a section to a concise survey of industrial and commercial conditions in the United States. It will furnish general information in regard to commercial organizations, commercial laws and the details of the organization of American public utilities, railroads, mineral resources, etc. The publication has the official approval of the Russian Government and will be distributed by the Russian-American Chamber of Commerce in Moscow and its branch in Petrograd.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

FOR SALE — ONE (1) PLAIN LANDIS Grinder, 10" x 30"; in good working condition. Price reasonable. Apply Canada Forge Co., Welland, Ont. (20)

FOUNDRY AND MACHINE SHOP WITH stove patterns and stock. Splendid opening. Apply Mrs. Thomas Johnston, Kemptville, Ont. (23)

FOR SALE—BERTRAM WAVING ATTACHment for eighteen pounder shells. First class order. Will sell cheap. Lymburner, Limited, Corner Berri and Commissioners, Montreal, Que. (22)

FOR SALE—STEEL WATER TOWER WITHout Tank, 94 feet high. Will support tank holding 13,000 gallons. Cost new $1,600. Will sell for $400, f.o.b. Shawinigan Falls, P.Q. Northern Aluminum Co., Limited. (21)

FOR SALE — ONE NEW FORD SMITH Grinder for Shrapnel. A short time ago we purchased five, find four will take care of our work. The National Manufacturing Co., Brockville, Ont.

1—2-SPINDLE SHAPER, WOOD TOP, JOHN Ballantyne, Preston, make. used two months. 1 Dynamo, 45 lights, Toronto and Hamilton Electric Co. make. Used five months. Good as new. Box 195, Jordon, Ont. (R.T.F.)

1—C.G.E. TYPE 10—20 H.P. INDUCTION Motor—60 cycles, 220 volts, 45 amps.—1200 R.P.M., complete with Auto Starter. Pulley on Motor 12" Diam. x 10" Face. Cummer-Dowswell, Ltd., Hamilton, Ont.

FOR SALE—2—16 x 2 POWER FEED TURrets; 1—16 x 1½ Turret with threading attachments; 1—16 x 2 Turret; 1—16 x 8 Engine Lathe; 1—12 x 8 Tool Lathe; 1 Speed Drill. Apply J. A. Harvey, 16 Pearl St. (21)

FOR SALE OR RENT—MACHINE SHOP AND foundry, with garage. Good machinery, good locality. Lots of cars and boats. Power and rent very cheap. Box 334, Carleton Place, Ont. (21)

FOR SALE—ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator; in good condition. Richards-Wilcox Canadian Company, London Ont.

FOR SALE—COMPLETE MACHINE SHOP, fully equipped and working, in good city; low rent, cheap power; plant includes five lathes, Universal milling machine, grinder, etc. Will entertain partnership with practical man who has cash to invest, or sell outright. Box 201, Canadian Machinery. (21)

FOR SALE — COMPLETE LUMBER AND lath mill machinery, daily capacity seventy-five thousand feet, consisting of gang, single and double bandsaws, engine, boilers, etc. Fully equipped blacksmith and machine shops. Silsby fire engine, 2 streams of 2½ inch; good order. Log loader, capacity fifty thousand feet, ten hours; almost new. Exceptional manufacturing site bargains. Address The Rathbun Company, Deseronto, Ont. (18)

FOR SALE

Fox Monitor Lathe, 18" x 5' 6", 9-hole turret, cross feed, hollow spindle, 5-step cone; good as new. Plating dynamo, 6 volts, 250 amp.; used only a short time.

PENDRITH MACHINERY COMPANY
970 Queen St. West, Toronto (15)

FOR SALE

TWO ENGINE LATHES FOR SALE—ONE a 18" x 10' McKechnie & Bertram; the other other a double-end pulley lathe 18" x 10' between face plates; both ends completely independent; very suitable for cutting off base and open ends of shells. Turnbull Elevator Mfg. Co., Toronto. (22)

FOR SALE — TWO GOLDIE-McCULLOCH Wheelock Engines—cylinders 16" diameter, 38" stroke; both engines now running, but will be replaced with Hydro-Electric. Engines guaranteed to be in perfect condition, and will be sold complete with belt wheels, one 14' x 35" face and one 12' diameter with 24" face, also belting if required. Canadian Consolidated Felt Co., Berlin, Canada. (19)

PATENTS

THE PROPRIETOR OF LETTERS PATENT No. 126215, relating to "pump device," desires to dispose of the patent or to grant license to interested parties at reasonable terms, with a view to the adequate working of the patent in Canada. Inquiries to be addressed to the patentees, Aktiebolaget Ingeniorsfirma Fritz Egnell, Stockholm, Sweden. (21)

ELECTRODES — THE PROPRIETORS OF letters patent No. 127080, relating to "Process of manufacturing iron for use in alkaline accumulators," and No. 127081, relating to "Active masses for positive electrodes of electric elements, etc.," desire to dispose of the patents or to grant licenses to interested parties at reasonable terms, with a view to the adequate working of the patents in Canada. Inquiries to be addressed to the actual proprietors, Svenska Ackumulator Aktiebolaget Jungner, Stockholm, Sweden. (13)

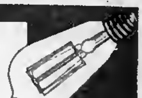
SITUATIONS VACANT

WANTED—FOREMAN TO TAKE CHARGE of Brass Foundry. Apply with full particulars. Box 203, Canadian Machinery. (21)

WANTED—YOUNG MAN TO HANDLE ADvertising of a line of engineering equipment Must be prepared to locate in a city of 15,000 population. Salary to start, $70 per month Box 184, Canadian Machinery.

MECHANICAL SUPERINTENDENT WANTed—for plant of the Starr Manufacturing Co., Limited, Dartmouth, Nova Scotia (near Halifax), operating one 10-inch and one 18-inch train of rolls, producing merchant bar iron. Manufacturers of ice skates and bolts and nuts. Address the company direct, stating age, experience, salary required, giving references, also when services will be available. The Starr Manufacturing Co., Limited, Dartmouth, N.S. (22)

WANTED



Burned out Tungsten Lamps, late type, drawn wire, 25, 40, 60 and 100 Watts, 110 and 115 volts.

DOMINION TUNGSTEN LAMP FACTORY
ST. CATHARINES, ONTARIO

SITUATIONS WANTED

LARGE SHELL MANUFACTURERS — MEchanical engineer with shop, designing and executive experience with prominent Canadian quantity producer of 9.2". At present employed. Best of references. Address, in confidence, Box 200, Canadian Machinery. (21)

REPAIRING

ALL KINDS OF MACHINERY REPAIRED, rebuilt and installed. W. H. Sumbling Machinery Co., 643 Yonge Street, Toronto, Ont.

WANTED

WANTED BERTRAM WAVING ATTACHment for 4.5 Shells, with or without Lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson Limited. (R.T.F.)

WANTED—HYDRAULIC PUMP, GOOD FOR 2,000 lbs. pressure capacity for 16" diameter cylinder press; belt-driven preferred. Canadian Consolidated Felt Co., Ltd., Berlin, Canada. (18)

ENGINEER WANTS AGENCIES FOR MONTreal and district. Side line or specialties, on commission basis. X.Y.Z., Canadian Machinery, Montreal. (19)

WANTED — BERTRAM WAVING ATTACHment for 4.5 shells, with or without lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson, Limited, Hamilton, Ont. (rtf)

BOILERS WANTED—TWO SECOND-HAND, about 150 H.P.; at least 80 pounds working pressure under Ontario Government Boiler Regulations. Give full particulars, Box 198, Canadian Machinery. (19)

IF what you want isn't advertised in this issue, consult our Buyers' Directory, Page 65.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, JUNE 8, 1916 No. 23

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 22 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

AN EXTERIOR IMPRESSION OF MONTREAL'S TECHNICAL SCHOOL.

The Montreal Technical School, Its Equipment and Service

Staff Article

In the brief space of some five years since establishment, the Montreal Technical School has amply demonstrated its worth as a developer of our national, commercial and industrial enterprise. A recital of the contributory factors which have influenced its achievement in these respects should, in consequence, be at once interesting and instructive, besides lending impetus to the movement for further installation of similar institutions within our borders.

IN the early days of modern engineering the opportunities of acquiring a knowledge of the principles of various branches, either from a practical or theoretical standpoint, were very limited, in comparison with those of the present time. The remark is often heard that "there are fewer possibilities for advancement now than years ago." This in many respects is a mistake, for while the achievements of the scientific world in the past quarter of a century have been exceedingly remarkable, the probabilities are that the next twenty-five years will surpass all previous records; and it is the boys and young men of today that we must look to for the accomplishment of these future developments, in all branches of science and engineering.

Before the advent of systematic training, the average boy was generally taken into a workshop without any previous knowledge of the duties he would have to perform; and his success, or failure, resulted largely in his ability to adapt himself to his new environment, aided possibly by the advice and instruction of one or two of his shop mates and occasionally the foreman.

The ideal system of training for engineering trades is by means of technical schools. Through these institutions, all classes of boys are given adequate and complete instruction in the various trades, both from a theoretical and practical standpoint, and the Montreal Technical School described in this article is a recent example of the perfection to which educational institutions of this nature have been developed.

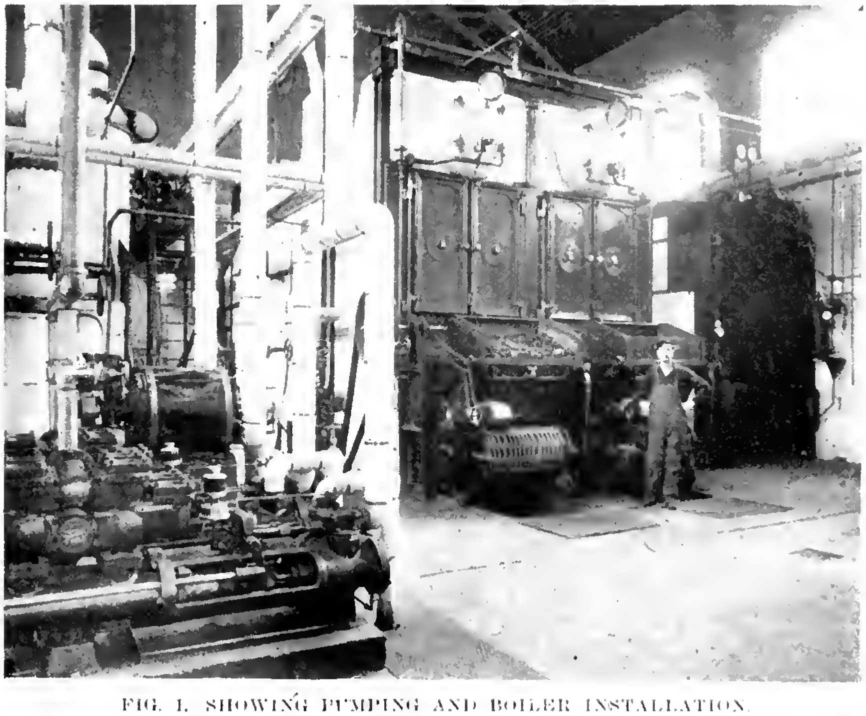


FIG. 1. SHOWING PUMPING AND BOILER INSTALLATION.

Main Building

This large commodious building, built and equipped at an approximate cost of $825,000, and annually subsidized by the Provincial Government of Quebec, with an additional yearly grant from the City of Montreal, was officially opened in 1911. The building is composed of two distinct sections, the main structure, which con-

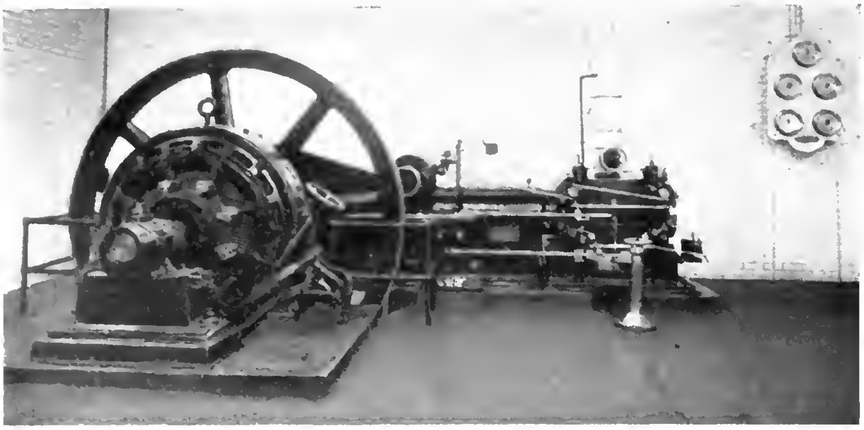


FIG. 2. CORLISS ENGINE AND GENERATOR OF 150 H.P. AND 125 K.W. RESPECTIVELY.

tains the administration offices, being located on Sherbrooke Street. In addition, there are several suites of class rooms for theoretical teaching, the various laboratories, two small amphitheatres to seat 100 each, one large amphitheatre with a seating capacity of 600, and a large hall.

In addition to requirements for instruction, the comfort of students is well provided for:—spacious and convenient waiting rooms, toilets and shower baths, appropriate furniture throughout, in fact, nothing has been spared to provide modern and efficient surroundings conducive to the success of the school as an educational institution, while from the viewpoint of comfort and hygiene, conditions approach the ideal.

Boiler Room

To the rear of the main structure are the power house and various work shops, all constructed along the lines of modern industrial practice. The power house, which is in the middle of the group consists of a boiler room, an engine room and a gas producer plant. The boiler room equipment shown in Fig. 1, consists of two Babcock & Wilcox 200 horsepower, water tube boilers, equipped with chain grates, operated by a Miller Bros. and Jones vertical engine; one Delaunay Belleville (French) marine type 100 h.p., hand fired boiler, with automatic regulated water feed, two-plunger type, Fairbanks-Morse pumps are used for the feed water, these are shown in the left foreground of Fig. 1. To the rear of the feed water pumps are two Kerr steam turbines, directly connected to two 24-inch centrifugal pumps, for supplying water to the forced hot water heating system, throughout the buildings. Two large Cochrane heaters are also installed, so arranged that one is supplied with exhaust steam from the

FIG. 4. PRODUCTS OF THE SCHOOL FOUNDRY, FORGE, AUTOGENOUS WELDING AND MACHINE SHOPS, ETC.

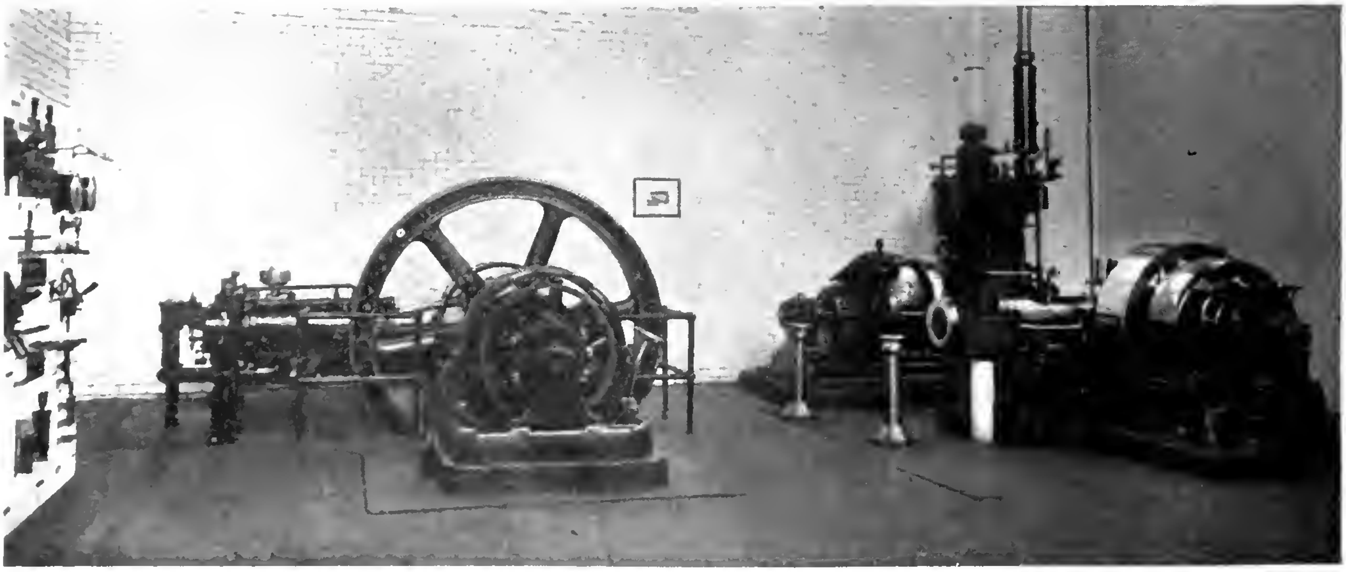


FIG SHOWING 35 H.P. HORIZONTAL GAS ENGINE, 35 H.P. HORIZONTAL STEAM ENGINE, AND COMPOUND VERTICAL STEAM ENGINE, DIRECT CONNECTED IN EACH CASE TO GENERATORS.

engines and the other with live steam from the boilers. In the event of insufficient exhaust steam being available to heat the water to the desired temperature, an automatic system of control operates a valve and allows the water to pass through the live steam heater before passing to the heating apparatus throughout the building.

FIG. 6. THE FORGE AND BLACKSMITH SHOP.

Heating and Ventilating System

An interesting feature of this installation is the utilization of every pound of exhaust steam for heating purposes before the addition of live steam becomes necessary and the consequence absence of back pressure on the engines. This system is so satisfactory that the return water after heating is only a few degrees below that of the outgoing or heated water. The large ventilating fans and steam coils are regulated by the Powers system of automatic temperature control.

FIG. 5. CARPENTER, JOINER AND PATTERN SHOP.

An allowance of 30 cubic feet of fresh air per minute is provided for each pupil with a liberal additional amount of ventilation in all class rooms and workshops.

A complete vacuum cleaning system is installed, with connections at convenient locations throughout the entire building.

Engine Room

In keeping with the general policy of instruction and at the same time to provide the necessary power equipment for the building the engine room units are of various, but modern types. The largest unit is that shown in Fig. 2, which is a 150 horse-power Goldie & McCulloch Corliss engine, direct connected to a 125 k.w. Allis-Chalmers-Bullock generator. The other three units are shown in Fig. 3. In the right background is shown the 100 horse-power vertical compound, Belliss and Morcom engine, equipped with forced lubrication system, and direct connected to 75 k.w. Westinghouse generator. Directly in front of this is seen the Robb-Armstrong 35 horse-power horizontal engine, direct connected to a 35 k.w. Canadian Crocker-Wheeler generator. To the left is shown a Duplex (French) 35 horse-power gas engine direct connected to a 25 k.w. Canadian General Electric generator. This unit is operated with producer gas, obtained from a small plant in the adjoining room. This consists of a Pierson (French), gas producer, with scrubbing and cooling equipment which delivers clean gas at a suitable temperature for use in the engine. A suction fan operated by a Robbins & Myers motor is used to start the gas producer. To operate the Duplex engine it is necessary to start with compressed air, which is supplied to a reservoir at a pressure of 175 lbs. per sq. inch. After the first stroke the gas is drawn into the engine and automatically regulated acording to the load.

In addition to the gas producer this room contains an Ingersoll-Rand air compressor for supplying high pressure air for pneumatic tools, etc.

It might be stated here that practical lessons on the construction and operation of gas and steam engines are given to engineering students by their class

FIG. 7. THE GREY IRON FOUNDRY.

FIG. 9. VIEW IN MACHINE SHOP.

instructors, aided by the engineer of the power house; in addition to which there are numerous models, in section, of feed water pumps, injectors, and many engine room accessories from which the pupils are given personal instruction.

Main Switch Board

The engine room switch board consists of seven panels of polished white Italian marble. The feeder panels from which radiate the various primary circuits contain a Bristol watt-hour meter for recording total station output, and three double pole plain overload circuit breakers. Knife switches, with enclosed fuses on the face of the board, control the lighting feeders. The accumulator panel is equipped with meters, overload breaker, a battery rheostat and an eleven point end cell switch. The generator panels are fitted with Weston flush-type ammeters, with a range of 150 per cent. of generator output; and three-pole knife switches with fuses on the rear of the board.

A voltmeter, located to the extreme left of the main switch board, and supported on a swinging arm, can be made to indicate either the bus bar voltage, the voltage of any machine, or the drop of potential between the bus bars and the ground.

Wood Working Shop

A fully equipped wood working department, with an area of 6,810 square feet supplies ample facilities for thorough instruction in carpentry, joinery and pattern-making. The machine equipment comprises eight power wood-turning lathes, four motor driven lathes of variable speed, one each, band saw, circular saw, jig saw, buzz planer, pony planer, mortising machine, tenoning machine, drill, shaper, trimmer, automatic band saw filing and setting machine, band brazer, and two grindstones; 30 benches, part of which are shown in Fig. 5, are also provided each with two separate sets of tools, one for the day and the other for the night classes.

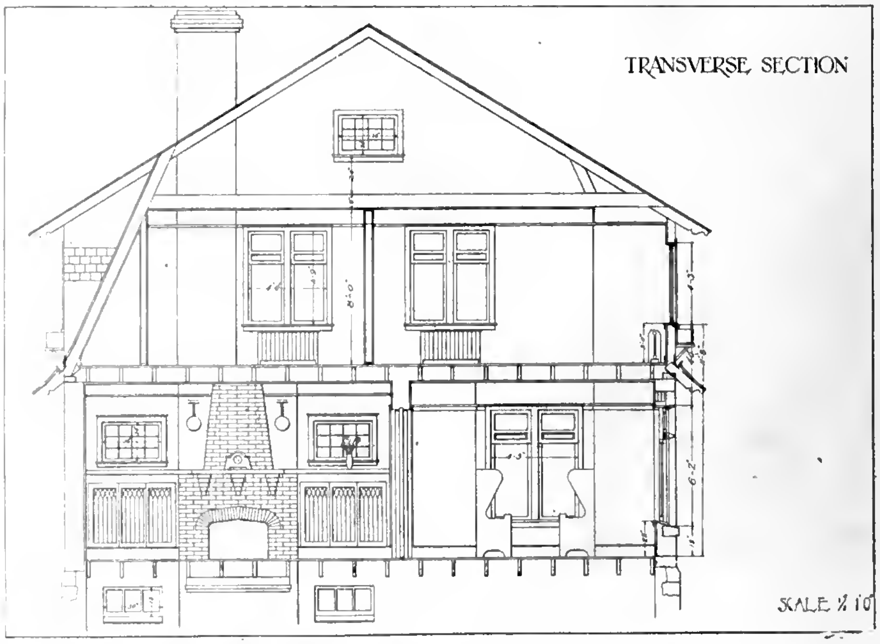


FIG. 10. SUBURBAN HOUSE—WORK OF A THIRD YEAR STUDENT.

FIG. 8. ELECTRICAL WORKSHOP AND ELECTRO-DYNAMIC LABORATORY.

Foundry

This department has a total area of 5,210 square feet and all the castings used in the various workshops are made here by the pupils, with the aid of the instructor. The equipment consists of a 2-ton per hour King cupola, one oil melting furnace, underground installation of compressed air for operating elevator and pneumatic tools and machines, two moulding presses, two core ovens, one core machine, one coning machine, one sand shifter, one sand mill, two snagging wheels, one torch heater and moulding benches for 24 pupils. Two 1-ton traveling chain blocks are used for transferring castings and material.

Forge Department

This section has a total floor space of 5,210 square feet and contains 24 Sturtevant forges, operated by forced blast supplied through underground piping from a 24-inch fan direct connected to a Sturtevant Co. four horse-power motor. A large 4-foot fan operated by a 9-horse-power electric motor is used to draw the smoke and gases from the fires and exhaust the same through the roof. This equipment is shown in the top background of Fig. 6. An anvil is supplied with each forge, and in addition there is one case hardening and tempering furnace, 30 inches square, supplied by the Buffalo Forge Co., one 170 lbs. steam hammer, made by Vulcan Iron Works, one Plessisville Foundry 75 lbs. spring hammer, one McGregor Gourlay Co. shear, and two swage blocks, two blacksmiths' vises, one tool bench and vise, and a plentiful supply of tools for each fire.

FIG. 12. AUTOMOBILE CHASSIS CONSTRUCTION AND ASSEMBLY.

FIG. 11. ANOTHER VIEW IN MACHINE SHOP.

Electrical Section

Directly adjoining the machine shop is the electrical work shop and electro-dynamic laboratory; the former containing one armature banding and heading machine, one notching press, one shear, one pair smoothing rolls and one buffer. In the laboratory are five groups of induction motors, one single-phase synchronous motor coupled to a direct current dynamo; one direct current motor coupled to a three-phase generator; one compound wound generator, one six-change commutator and one direct current motor coupled to an alternator. A large seven-panel switch board, fully equipped for experimental and operating purposes is also provided. There is also a switch board for telephone instruction, and a storage battery having a capacity of 200 ampere-hours.

Machine Shop

The large and modern machine shop, with a total floor area of 11,340 square feet, offers excellent facilities for thorough and efficient instruction in machine shop and tool room work. As shown in Fig. 9, the shop if of extensive proportions, well lighted and equipped with a large number and variety of different types of machines. All instructors have had many years of practical experience and are well qualified for their positions.

The machine tool equipment is divided into three sections, each section being driven by a 15-horse-power Croker-Wheeler motor. The machines installed are:

Drills.—One American Tool Works, 3-ft. radial; two 20-in. Rockford; two 16-in. W. F. & J. Barnes; two 16 in. Hoefer; four 12-in. Rego; one 10-in. Freeport; two 10-in. Hamilton Machine Tool Co.; one Washburn drill grinder.

Shapers.—Three 12 in. F. Pratt & Co.; one 16-in. R. A. Kelly.

Planers.—One 2 x 2 x 5 ft., and one $2\frac{1}{2}$ x $2\frac{1}{2}$ x 7 ft R. Gardener & Sons, Montreal.

Lathes.—Ten 10-in. Seneca Falls speed lathes; two 12-in. Seneca Falls; four Jones & Burton 10-in. gap; one Flather 15-in.; one Springfield 15-in. motor driven; three Fay & Scott 16-in. motor driven; one C. M. C. 18-in.; one Reed 18 in.; one Seneca Falls 14 in.; one Cisco 16 in.; one Von Wyck 18 in.; one Hendey 16-in. special lathe; and one Hare 6-ft. face plate lathe.

Milling machines.—One Brown and Sharp universal; one Jones & Burton horizontal; one Becker vertical; and one Greenwood & Batley vertical.

Miscellaneous.—Two Whiton centreing machines; two Greenerd arbor presses; one Becker automatic gear cutter; one Binsse horizontal boring machine; two screw-cutting machines; one Hartford automatic screw machine; one 7-in. slotting machine; one pantograph; one Columbia winding machine; one set 4 x 30 in. Brown Boggs forming rolls; one Max Ames power press; one profiling machine; one 36-in. Brown Boggs

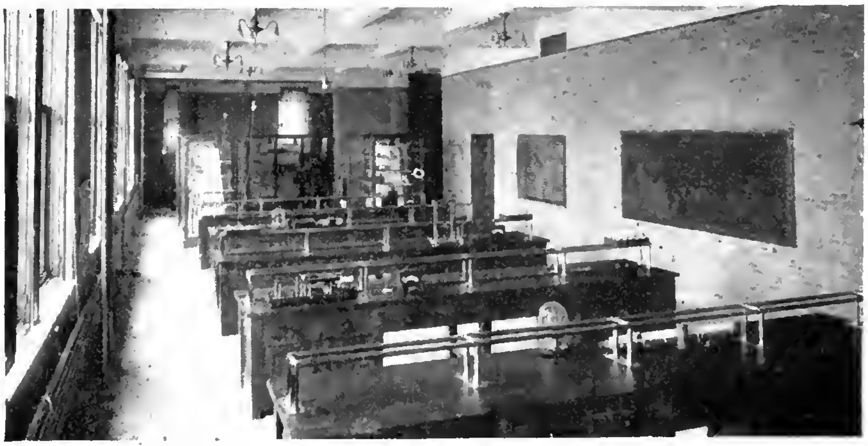


FIG. 13 PHYSICAL LABORATORY.

shear; one Norton universal grinder; two Montreal Technical School hack saws; two J. G. Blount grind stones and two 12-in. emery wheels.

In a seperate room are two Stewart furnaces for hardening and tempering tools and dies.

Oxy-Acetylene Welding

In a separate room are two Stewart being made in the use of the blow pipe for cutting and welding purposes, the authorities of the school, at the opening of season of 1914-15, started a night class on the uses and operation of the oxy-acetylene method of autogenous cutting and welding. This latest branch of technical education has met with very encouraging success. Some of the results of the first year's work are shown on the right hand table and wall panel illustrated in Fig. 4. This department is under the direct supervision of the "L'Air Liquide" Society.

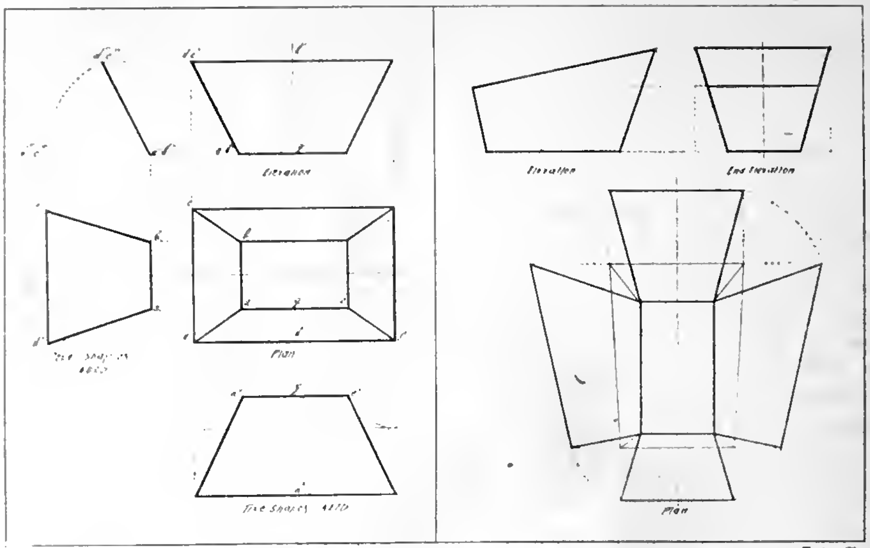


FIG. 15. RABATMENTS—WORK OF A FIRST YEAR STUDENT.

FIG. 14. EXHIBIT OF STUDENTS' WORK.

Industrial Drawing

In keeping with the high standard maintained by all the other branches, that of mechanical and architectural drawing has yielded very encouraging results. The boys receive instruction from the simplest form of free hand sketching, on through the various sections of elementary geometry, projection and development of surfaces, sketching from models and machines and assembling the same from the free hand sketches previously taken. That the work is of the best, can be shown by referring to the line reproduction here shown of the work of some of the students, whose average does not exceed sixteen. The work showing the transverse section of a dwelling and the details of the Roman Corinthian was accomplished by a boy seventeen years of age.

During the third year, pupils are permitted if they so desire to take detail sketches of operating machines in the shop and assemble the same as shown in the line cut of the slotting machine.

Rules and Duration of Classes

This school offers day courses for regular students, from September to June, and night courses from October to March; the latter intended primarily for workmen and apprentices at work during the day in the various manufacturing and building trades. As the school is not self-supporting a reasonable fee is charged for both the day and night classes; but in the case of boys wishing to take up a day course and not in a position to finance the same, provision is made whereby it is possible for almost any young man to receive the required tution, at practically little or no expense.

The day courses are organized principally for the benefit of young men, who, having recently finished their primary or elementary studies, are anxious to acquire manual proficiency, and the technical education necessary to become skilled mechanics, capable foremen or shop superintendents.

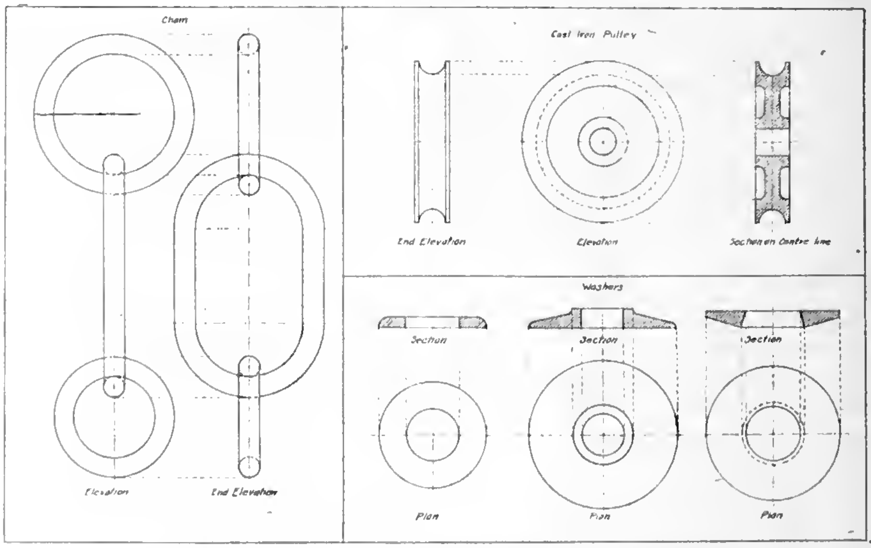


FIG. 16. PROJECTIONS—WORK OF A FIRST YEAR STUDENT.

As the school is situated in the Province of Quebec where the population is largely French, the day courses are given in two languages, consequently the pupils are divided into two distinct groups, for class or theoretical instruction; but both sections are united for practical work in the various shops.

Both the theoretical and practical instruction are very thorough; the former covering arithmetic, algebra and trigonometry, elemental and descriptive geometry, general and industrial physics, electricity, general and applied mechanics, drawing in all its branches and industrial technology.

Unless a boy has definitely decided on a future course, the first year at the school is for the purpose of finding out the qualifications of each boy for certain branches of engineering activity. While a young boy may feel he would like to take up a certain line of work, it is often found that his gifts and inclinations can be developed to far better advantage in some other lines.

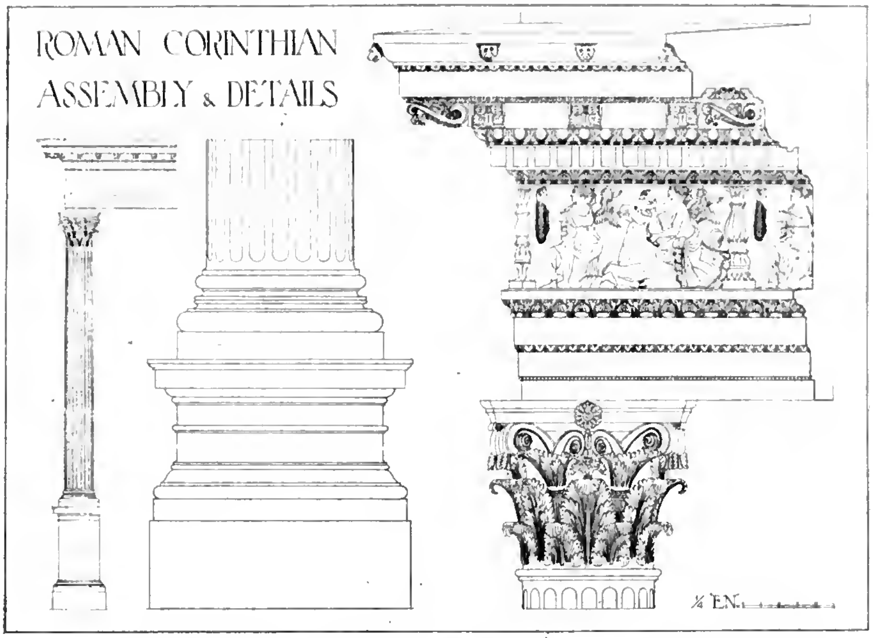


FIG. 18. DECORATIVE ORNAMENT—WORK OF THIRD YEAR STUDENT.

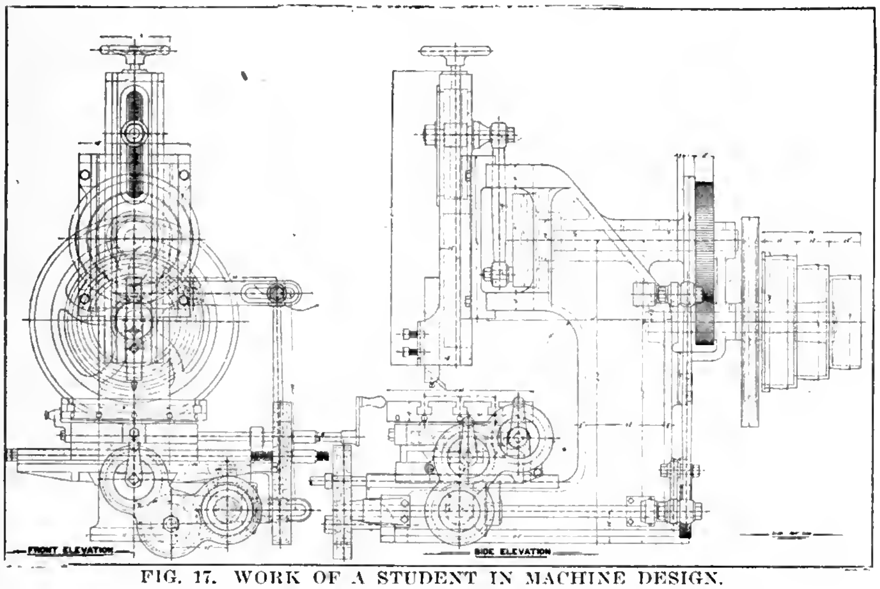


FIG. 17. WORK OF A STUDENT IN MACHINE DESIGN.

While certain rules govern the course of the boys through the various classes, a reasonable amount of latitude is given to each pupil to develop his individual initiative. With this method it has often been found that a dormant mind has been awakened from a state of indifference to one of marked activity.

The normal duration of each course is three years, but those students who have passed satisfactory examinations and been granted diplomas, may, if they so desire, and are duly qualified, take an additional year in advanced work, or to specialize in some one branch such as electricity, industrial drawing, automobile construction, etc.

Results of Instruction

It is very difficult to convey to the readers any definite conception of the achievements of these pupils, as it would be necessary for one to view the work at close range to fully appreciate the remarkable results obtained in the various branches of the school. However, some idea can be conveyed, to the uninitiated, by referring to Fig. 14, which illustrates a section of the exhibition hall. With the exception of the covers on the tables every visible object was constructed by the pupils, and when it is considered that the average age of these boys will not exceed sixteen years, the ultimate result of a few years training is very obvious. The work here exhibited surpasses, in many respects, that of a large number of journeymen mechanics now working at the various trades. A closer view of some of the work is shown in Fig. 4. The left hand panel contains some of the work of the first year pupils in foundry work, while the table display is that of second and third

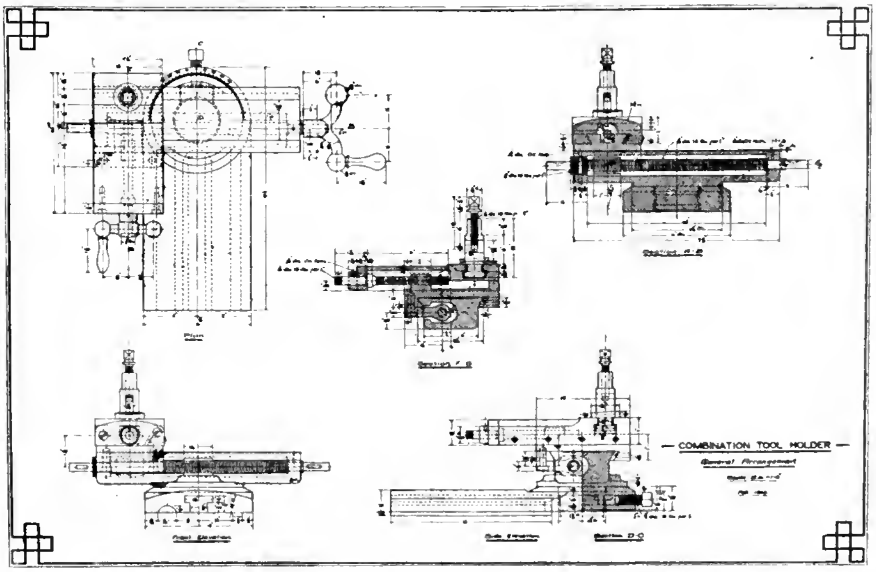


FIG. 19. WORK OF A STUDENT IN MACHINE DESIGN.

year students. The centre panel and the objects directly below illustrate some of the work performed by pupils in forging; while the work to the right is that of the oxy-acetylene department. In addition to the work here shown are several large show cases containing some of the finer work of the machine and electrical classes.

QUEENSLAND MINERALS AND THE WAR

IN Queensland we have rich deposits of molybdenite, wolfram, and such metals as are required for the manufacture of steel. With such an abnormal demand for high-grade steel for munitions of war as exists at the present time, why cannot these deposits of molybdenite and wolfram be worked? says a Queensland paper. The cry in the past has been that the profits allowed by the metal combine are so infinitesimal as to make the working of the mineral unprofitable, in view of the fluctuations on the market. This cannot now be said, and with molybdenite at £525 awaiting those willing to undertake the work. The output of molybdenite this year has been considerably increased, but even then only a few hundred tons have been extracted. The production during the coming year should at least be trebled. Some of the mines are now working for the extraction of this mineral, but a lot more could be done. The Government has decided to establish a State battery for the treatment of molybdenite in the Herberton and Chillagoe districts, and it is now in course of erection.

EMPLOYMENT OF WOMEN IN GERMANY

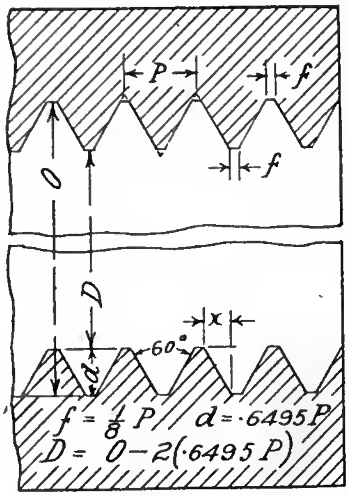
THE number of persons engaged in German industries in January, 1916, was about 9.3 per cent. below the peace-time average. The greatest increase is in mining and in the chemical, iron, metal and engineering industries, but only in so far as the works affected are making war material. This is indicated in a review of the labor market in the German Empire in January, 1916, published recently by the Government and based on reports from 39 industrial associations and 442 business undertakings. Of the latter, 362 firms employed an aggregate of 312,105 hands, compared with 270,148 in January, 1915. The increase consists almost entirely of women, the men employed being only 11,000 more than a year ago and made up largely of prisoners of war or inhabitants of occupied territory.

Some machine men run belts entirely too tight, causing a large increase in friction in the bearings, thereby consuming extra power.

Questions and Answers

Question.—Without the use of a table how can the bore of a hole be calculated for the standard United States thread?

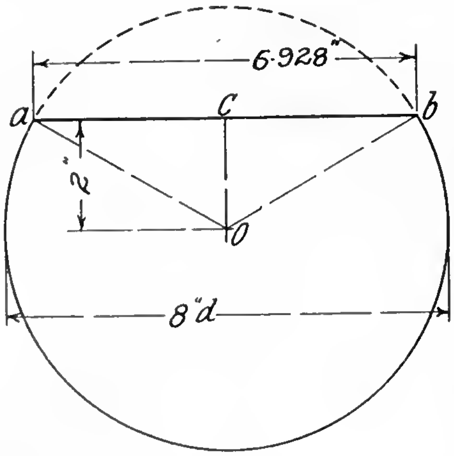
Answer.—As shown in the sketch, the flat on the top and bottom of the thread



is equal to 1/8 of the pitch; therefore, the distance x will equal the pitch minus twice the flat or 1/4 of the pitch. Then to find the depth use the formula, side adjacent = cotangent × side opposite, or 1.73205×3/8P; for example, to find the bore for a 4-inch diameter, 3-thread U. S. screw. The depth would be 1.73205 × 3/8P, or 1.73205 × 3/8×.333 = .2163 inch. Then bore would be 4 — (.2163×2) = 3.5674 inches. From the above a formula may be derived which will simplify the operation, thus—1.73205×3/8P = .64952P, which multiplied by two will give the total amount to be deducted from the diameter of the bolt or male thread.

* * *

Question.—A sphere 8 inches in diameter is to be shaped off to form a



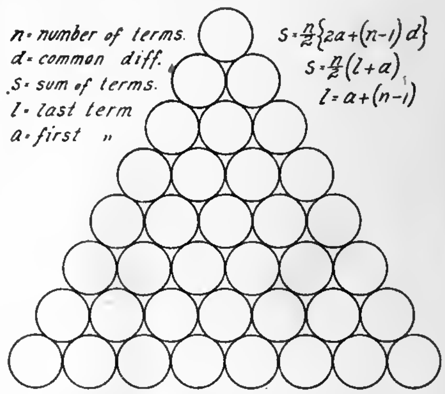
flat surface 2 inches from the centre; what will the dimensions be of the exposed surface?

Answer.—It is quite evident that the surface will form a circle; then to find the diameter, use the formula for the solution of right triangles; that is, the square root of the sum of the squares of the two sides will be the length of the hypotenuse. Therefore, the length c-b will be $\sqrt{(ob)^2 - (oc)^2} = \sqrt{4^2 - 2^2} = \sqrt{12} = 3.464$ inches. Then the diameter a-b of the exposed surface will be $3.464 \times 2 = 6.928$ inches.

* * *

Question.—When shafts are piled, as shown in the sketch, is there any method whereby the total number can be calculated besides counting them? If there are fifty in the bottom row, and each row upward is less by one, how many would be in the pile; and, if instead of reducing by one, the rows reduced by two or more, what would be the total?

Answer.—This can be solved by arithmetical progression, where n equals the number of terms, d equals the common difference, s equals the sum of the terms, l equals the last term, and a equals the



first term; then the above question can be solved from the formula $s = \frac{n}{2}(l+a) = \frac{50}{2}(50+1) = 1275$. To solve for s from the accompanying sketch, $s = \frac{n}{2}(l+a) = \frac{8}{2}(8+1) = 36$.

Suppose instead of being piled to the top, there was only 5 rows, the value of s or total shafts would be $\frac{n}{2}(l \times a) = \frac{5}{2}(8+4) = 30$.

Now, if the rows reduced by 3 from the bottom row, the top row containing 8 and the pile fifteen rows deep, the total would be

$$s = \frac{n}{2}[2a + (n-1)\ d] = \frac{15}{2}[2 \times 8 + (15-1)\ 3] = 435$$

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

EFFICIENCY IN THE ENGINEERING BUSINESS

By "Onlooker"

THE matter of power is apt to be overlooked to some extent in most industries in which it plays a part, and although in the engineering world it gets, perhaps, a greater degree of attention than in many others, it does not get quite all the attention it deserves. It has been estimated that in all industries the average percentage of the total cost of production which is expended in the generation of power is only about six per cent. The writer ventures to think that under existing circumstances this is a low estimate, at least as far as the engineering industry is concerned, in which ten per cent. is probably nearer the actual figure when all factors are taken into consideration. At the same time, given power plant of an efficient nature and modern distribution methods, there is no reason why the cost of power should exceed five per cent. of the total running costs of any plant, while under favorable conditions it may be considerably less. And in these days of modern competition cheap power may just be the factor which forms the dividing line between a profit and a loss.

Favorable Power Supply

In this country the majority of engineering concerns are fortunate in the matter of power. Located for the most part in industrial centres which are supplied with hydro-electric power at low rates, the power problem is largely solved. Electric power is of all forms of power the most adapted to the engineering shop, and where this is available at reasonable rates from public mains the difficulties of an economical power supply are reduced to a minimum. Yet even in such favorable circumstances a study of economy is advisable, as it is a profitless thing to run up unnecessary power bills. Where cheap current is available a system of distribution giving the most efficient results should be adopted, and in order that this may be accomplished several considerations must be examined. In the first place small motors are generally less economical by an appreciable amount than larger ones, and therefore a large number of very small power units are wasteful in current and are also more expensive to install and run up bigger bills for interest on capital invested and depreciation than a few larger units. On the other hand where a whole shop is run by a few large power units there is a big loss in friction, due to the necessary mechanical transmission, which becomes particularly pronounced when only a few machines are being operated, as often happens during small night shifts or when only a few machines are being operated. Between the two extremes of a whole shop being driven from a single high power motor and that of an individual motor to every machine there is a happy mean course which probably gives the best results. It is to have the larger machines, requiring 15 horsepower and upwards, driven by individual motors, and the other machines grouped in twos, threes, fours or fives, depending on their size, and driven from a common shaft operated by a motor of suitable size. By this method the loss in efficiency due to the use of very small units is largely avoided, while if only a few machines are required to operate at a given time, after the rest of the shop is closed down, it will not be necessary to run the whole of the shop shafting, with its accompanying heavy loss by friction, in order to do so.

Prime Mover Choice

Where public hydro-electric power is not available at a reasonable rate it will usually be advisable to generate power on the premises, and distribute electrically through motors along the lines indicated previously. Of prime movers the choice will usually rest between natural gas, where this is available, steam plant with coal or natural gas firing, and pressure or suction producer gas plant. Whichever of these forms of power is advisable must depend upon the location of the plant. Where good steam coal is easily obtainable, a modern steam plant will probably give the best results, owing to its reliability, and even where natural gas is found it may frequently be advisable to adopt a steam plant fired by gas. Where the only available supply of coal is soft a producer plant will give excellent results in so far as economy in fuel and attendance is concerned, but unless this description of plant is of first class design and cared for by men who thoroughly understand it there is a possibility of occasional breakdowns which may hold the whole plant up for considerable periods and involve losses which its economy will fail to compensate for.

Electrical Energy Feature

Whatever form of prime mover is adopted it is generally good practice to convert the mechanical into electrical energy and to distribute it in the manner indicated above. Direct mechanical transmission is often very uneconomical. Of the gross power developed in the cylinders of an engine it is safe to say that, where mechanical transmission is employed, an average of nearly fifty per cent. of that power is absorbed in friction in the engine, the shafting and belts, while with electrical transmission this loss is reduced to about twenty-five per cent., or even less. In one case which came beneath the writer's own notice no less than seventy-five per cent. of the gross power developed by the engine was absorbed by the mechanical transmission, and this represented a cash loss to the company of no less than $3,000 annually, although the plant was only of 100 i.h.p. This was an exceptional case, but it demonstrates how neglect of power matters may involve a very considerable leakage.

Another argument in favor of electrical distribution where mechanical generation is employed is the gain obtained when only a few machines of the plant are operating on a rush job during the evening or night. Where mechanical power distribution is employed this means that the attendants have to be retained to run the power plant and also that a great deal of the power generated is wasted in running shafting useless save to transmit the power of the engine to that part of the shop where the machines to be operated are located. Where electrical distribution is employed, on the other hand, the addition of a few storage batteries to the plant will enable the engine to shut down at the usual time, the machinery being run by stored energy, and all the shafting which has to be run is that length upon which the particular machine is located. This saves loss of power by friction and also the expense of paying overtime to the engine attendants.

Individual Motor Drives

Individual motors on larger machines are always to be recommended. These are now made so that they operate efficiently over a wide range of speeds, and thus gearing is done away with and a more finely graduated range of speed rendered possible. This last consideration is worthy of notice. There is one speed at which any given piece of work can be machined at a maximum efficiency, and where there are only four, or even eight, speeds on a machine it is not always possible to adjust that machine

to the ideal speed. The more speeds there are on a machine the more nearly may it be adjusted to the best possible speed for any given piece of work, and the finer adjustability of the variable speed motor as compared with the mechanically driven tool gives the former a big advantage for this reason.

The cost of installing electrical for mechanical transmission is not very great, while the results obtained may be very great indeed. Where an engineering works is scattered, or is very large, or where it is frequently found necessary to keep a part of the machinery running after regular hours in order to keep up with the work, it will almost always be found that the saving effected by changing from mechanical to electrical transmission will be found to be a paying investment.

Shafting Roller Bearings

A point in power transmission which is worthy of attention is the growing use of ball or roller bearings in place of the older bushed types. Where shafting is employed, whether it be in relatively short individual lengths in case of electrical transmission or in longer units where mechanical transmission is employed, a considerable saving can be effected by adopting ball or roller bearings. Of course this saving is much more marked in the latter instance, but is not negligible even in the former. In one case, which recently came beneath the writer's notice, a certain shop found it necessary to install quite a number of extra machines in order to cope with growing business, and when these and their shafting had been put in it was found that the engine could no longer handle at normal speed the increased load. The management was reluctant to have to install new or additional steam plant at that time, and solved the problem by changing the old bearings for ball bearings. Several other machines have been added since then but the old steam plant is still capable of running the whole shop at normal speed. Whether it would not have been better to have changed from mechanical to electrical transmission is a question, but as the shop in question was not very large, and was built on a compact plan it is probable that the ball bearings gave just as good results as electric motors would have done.

SHELL MAKING TOOLS

By Henry McLaren.

I NOTICE in your journal of April 13, an article signed by "W. J. M.," who is very sorry for the designer of the shell chucks illustrated on page 311 of your issue of April 6; in fact he appears to be very sorry for the Old Country engineers in general.

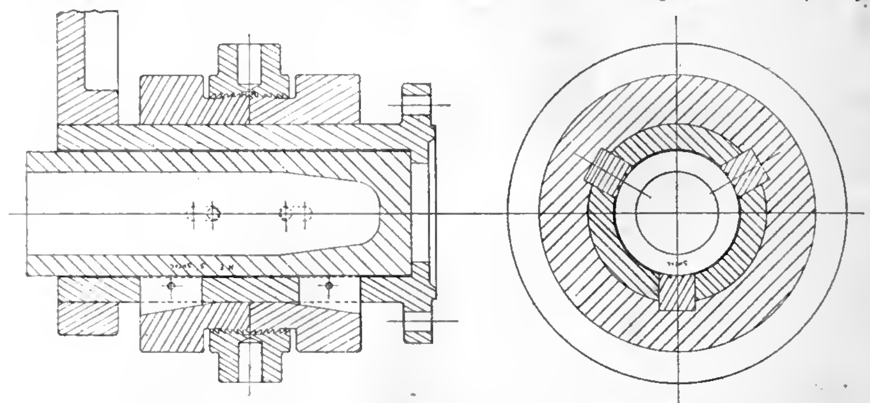
I am the designer of the said chucks, but I have no time to waste on "W. J. M.s" criticisms. He has evidently been misled by the description in the "Engineer," for which I am not responsible. Our collet rings are not coned, as "W. J.M." supposes; I think that must be an invention of the "Engineer." We sent them a copy of our catalogue and book of instructions some time ago. These instructions are illustrated with diagrams, to enable any mechanic (who is supposed to have the chuck before him) to dismantle or assemble it with the least possible trouble. The "Engineer" picked out one or two examples and published them. These diagrams were not intended to clearly set out the merits of the chuck, they were simply an aid to a man who had the fixing of the chuck; therefore I don't blame the "Engineer" for saying the collet rings were coned. If he had seen a working drawing of the chuck he would have known more about it, and have saved me from the wrath of "W. J. M."

The "Engineer" also says my firm is "J. & H. McLaren, Limited." I beg to correct him; we are unlimited, and my capacity for slacking, and my horror of letter writing, is the most unlimited feature of our concern.

I therefore send you a copy of this book of instructions, along with a drawing (No. 6499) of our chuck attached to the boring lathe you illustrate on page 331, and I leave it to you or your readers to decide whether or not it is a judicious mixture of common sense and cast iron.

From this drawing you can see that the collet rings have tapered slots cut in them, to take the jaws. The rings and sleeve are bored, turned, and ground, to absolute sliding fits. The large nut, with right and left hand screws, forces these rings apart, and they in turn wedge the jaws in against the shell. Whatever pressure is applied to one set of jaws must react on the other set with exactly the same pressure. Each ring is fitted with three jaws, therefore, the pressure is distributed equally between the six jaws; even if the job is different diameters in each set of jaws, they will still nip down with equal pressure on all them. The jaws are arranged to take a long hold of the shell, and as explained in our book, the jaws, after hardening, are all ground out true in place.

"W. J. M." expresses surprise that our machine shop should be wholly occupied in making these chucks. He cannot be more surprised than we are, for although we have been running night and day—including Sundays—for the past year, during which time we have made many thousands of these chucks, the demand is as great as ever, only it



DETAILS OF CHUCK REFERRED TO BY HENRY McLAREN.

is for chucks for the larger sizes of shell.

"W. J. M." is not content to remain as critic, he must try his hand at designing. On page 329, Figs. 1 and 2, we have his productions. I only make one criticism. In Fig. 2, when he gets even a moderate pressure on the jaws, how is he going to turn that nut? I think Fig. 2 might prove a success as a nut-locking device, if it does not prove a success as a chuck; but I am afraid the coned face inside the nut will be soon cut out by the jaws. A word in your ear, Mr. W. J. M., where you have great pressure, avoid movement as much as possible, and the job may last out the war.

I might write a chapter on each of his designs, but will spare your feelings. I note the remarks of "W. J. M." on pot chucks with draw in collets, also I see an ild friend in the adapter centre he illustrated on page 330—we have made them both. I feel tempted to explain one or two things about them to "W. J. M.," but alas I am now completely exhausted.

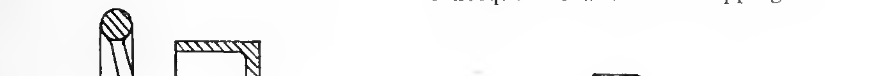
SHELL MAKING TOOLS

By W. J. M.

THE letter from Henry McLaren in reply to my criticisms of his chuck in your issue of April 13, has explained several points, uncertainty regarding which prompted my communication. The illustration and description of Fig. 1, page 311 of Canadian Machinery, gave me the impression that the ring D was a hollow cone which fitted at its smallest diameter on the chuck body A. Had the front end of ring D been shown

slightly ahead or back of the end of jaw E it would have been clear at once that ring D had a parallel bore for its full width, and was provided with inclined grooves to fit the outer edge of the jaws. The greatly increased wearing surface thus available between the ring and the chuck body removes the objection which I raised, viz., that after severe service the ring and the jaws would be floating and held in position by friction only. The use of the term "conical collet" in the original article is not correct and conveys a wrong idea.

The rough sketches submitted by me are certainly open to criticism on the points raised, but the point which I had in mind, apart from constructional details, is that collet chucks, either of drawn-in or push type, entirely preclude any possibility of inaccuracy through wear such as might occur in Mr. McLaren's chuck. The predominance of collet chucks such as I refer to, in Canadian shops is one reason for my high opinion of shell makers in this country. Their rapid operation has had much to do with their popularity. One case in particular impressed me where 18 pdr. shrapnel had the bands machined complete from floor to floor in 27 seconds, this being due to the manner in which the chuck was automatically tightened by the movement of the carriage in bringing the tool into operation. In fact with a skilled worker the spindle was never completely at rest, a thing which could not happen with McLaren chucks. As a further argument in favor of the status of Canadian shell makers, I enclose sketch of expanding arbor for comparison with the one shown in catalogue. The Canadian article was built and in use three months after the war started. The two devices are similar but the English one lacks the adjustment obtained by the small handwheel, so that in case of large or small bore forgings the length of thread left in the tightening nut would be seriously diminished with consequent chances of stripping.



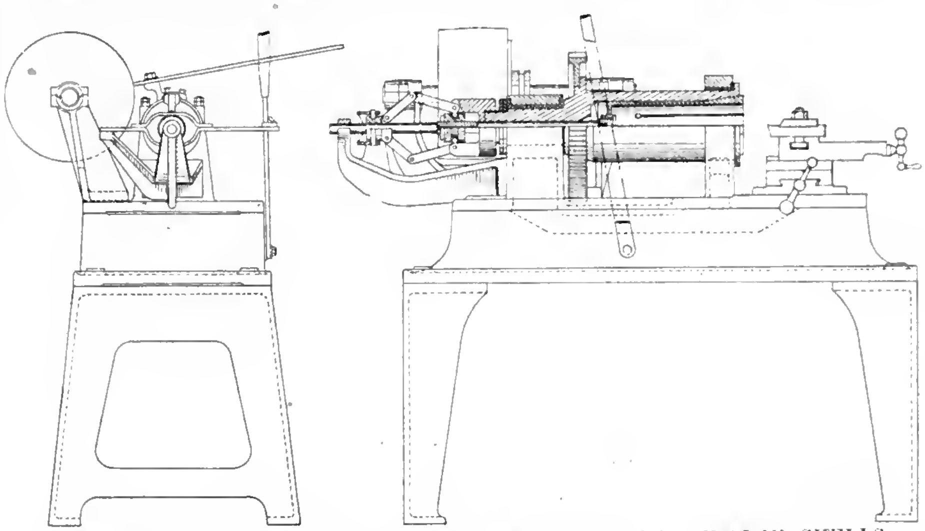
UPPER: CANADIAN ARBOR, AND LOWER, ENGLISH ARBOR REFERRED TO BY W. J. M.

In conclusion I might mention that I have seen 18 pdr. shrapnel rough turned, based faced and rounded in 4½ min., and bored complete inside to gauge in 39 sec., also 4.5 in. forgings are being cut off, base trimmed and rough turned simultaneously in an ordinary engine lathe with special tooling at the rate of 250 in ten hours, and not a single shell has been spoilt in the last machine out of 20,000, so far.

LATHE FOR SHELL BASE OPERATIONS

By H. P. Hoag

A SINGLE purpose lathe for facing off gas and plugs and adjusting weights of 4.5 Howitzer shells, and may be adapted to other base operations.



LATHE FOR FACING BASES AND SIMILAR OPERATIONS ON 4.5 IN. SHELLS.

The hollow spindle is of cast iron and the collett chuck can be of steel or brass. The lathe spindle is driven from a clutch pulley at the back through a pair of two to one gears, the belt pulley being 14 in. dia. by 6½ in. wide, running not less than 200 revs. per min.

The lever shown on front of the bed in both views opens the collet clutch when moved to the left, and also releases the driving clutch at the same time. After changing shells the collet clutch has to be tightened first, before the driving clutch can be engaged.

The lathe can be placed anywhere about the shop and belted direct to line shafts, no countershaft being used. With the above combinations of collet chuck and clutch pulley, controlled by short levers close at hand, this lathe is very quick to operate. It has all the advantages and none of the disadvantages of the air actuated outfits.

WELSH TIN-PLATE PRACTICE

THE London correspondent of the Iron Age writes as follows:—"A new tinplate plant has gone into operation in one of the Welsh works and has attracted considerable attention. The finished black plates as they come from the cold rolls and annealing furnaces are passed, without any handling, through the pickling, washing, tinning and cleaning processes, and the finished plates are piled up as completed, ready for boxing and shipment. One pot which has been running a few weeks under ordinary working conditions is turning out about 2,200 base boxes a week, and another pot, just started up, made even a better output. The innovation is said to be the most important since that of the morewood pot.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

VALVE RE-SEATING MACHINE

WHILE the Dexter Valve Re-seating Machine is not by any means a new appliance, recent developments and improvements in its construction have given it a wider range of usefulness in various branches of engineering, repair and overhauling.

When this device was first designed, it was then only contemplated to reseat globe type valves; other types of valves had not been considered. However; the success attained in their original purpose, encouraged the makers to further develop the apparatus, until at the present time the variety of uses to which it can be adapted is almost without limit.

Fig. 1 illustrates the latest improved type of machine for re-facing valves from 3 to 6 inches. It is shown operating on a flat-seated valve. The general construction of the various sizes is more or less identical, but, in the case of this and the larger sizes, special provision is made to reduce the power required to operate the cutter.

Where the small sizes are direct driven by means of the power handle secured to cutter spindle, the larger size machines, as shown in Fig. 1, are operated by bevel gears, running in special brackets; the gear ratio and bracket construction being, of course, suited to the size of the machine.

The jaws of the universal chucking arrangement can be adapted to either internal or external use, the long sleeve in which the cutter spindle revolves, insuring the utmost rigidity, even on the heaviest work. The faces of the cutters are so constructed, that all possibility of chatter is entirely eliminated, resulting in a clean smooth finish.

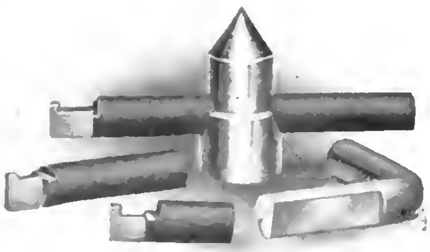


FIG 2 CUTTERS FOR CHANNELING WORN VALVE SEATS.

After a valve has been re-faced a number of times, there arises the possibility of cutting into the uneven portion of the metal surrounding the valve seat. To overcome this, and at the same time extend the life of the valve, the attachment shown in Fig. 2, has been designed. By this simple device, a channel is cut around the old seat leaving a new ridge for further facing. By removing the sleeve and cutter spindle from the universal chuck, and securing same in a special frame as shown in Fig. 3, the valve disc can be re-cut.

FIG. 1. MACHINE FOR RESEATING VALVES FROM 3 IN. TO 6 IN.

The adjustment and operation is quite simple. With one setting of the head, a crowning face can be cut, and, by feeding forward, on the knurled nut, a 45-degree angle can be cut. Again by utilizing the feed nut of the machine, a true surface can be turned parallel with the axis of the spindle.

While this device was originally designed for a special purpose, it may be adapted to many jobs ordinarily performed in a small lathe. A larger size, suitable for the heavier work is also constructed.

Darling Bros., Montreal, are the sole manufacturers in Canada of these machines.

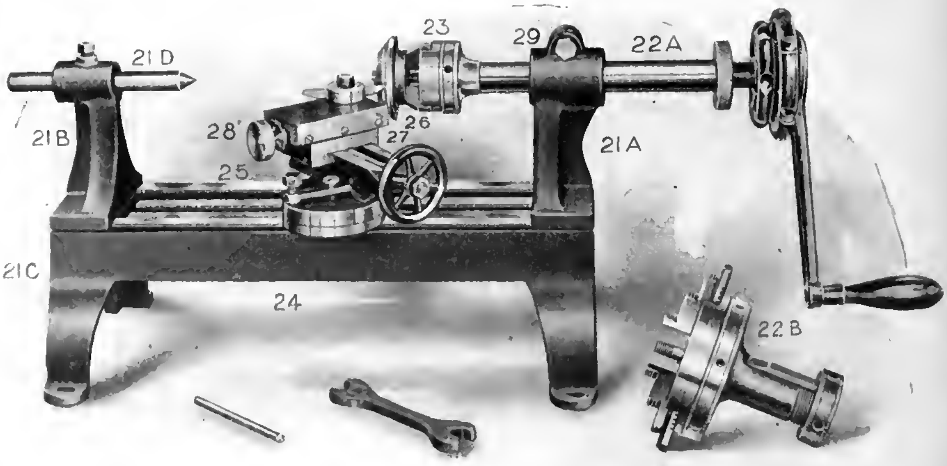


FIG. 3. RE-MACHINING DEVICE FOR WORN VALVES.

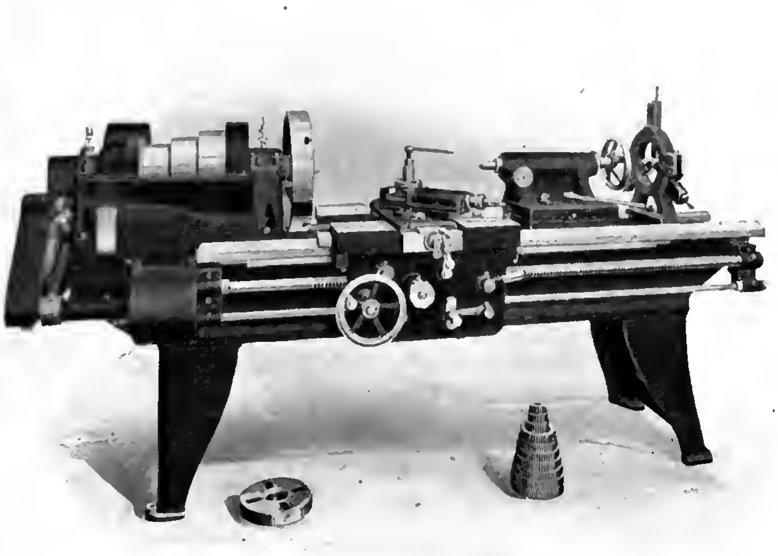
TOOL-ROOM GRINDER

A TOOL-ROOM grinder suitable for performing all grinding operations on fine tools has been placed on the market by the Dominion Machinery Co., Toronto. It is built in both plain and universal types, the former being supplied with headstock and tailstock, cutter support and double countershaft. The universal machine has additional equipment consisting of internal grinding attachment, swivel vise.

The table can be set to any angle for aligning centres and is graduated in $\frac{1}{8}$ of an inch per foot. Main spindle is hardened and ground and revolves in ring oiling bearings.

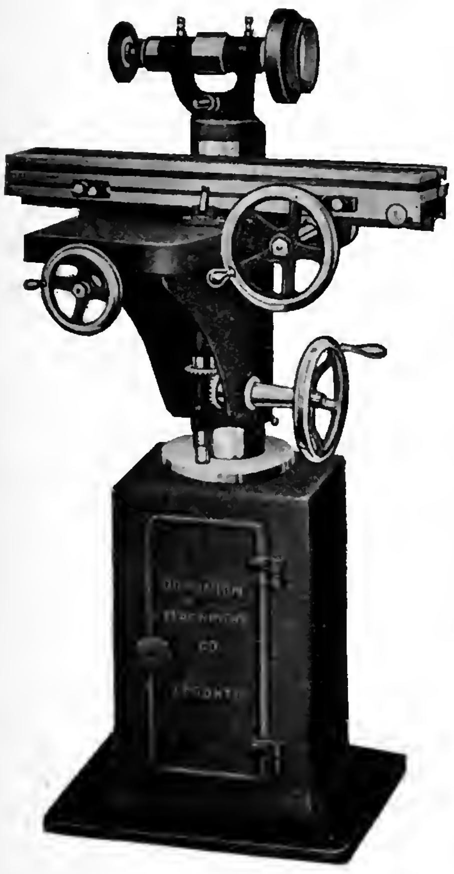
SEVENTEEN-INCH PLAIN CHANGE ENGINE LATHE

THE lathe shown in the illustration is built in two sizes, 17 in. and 19 in by the Sidney Tool Co., Sidney, Ohio. It is of the double back geared plain change type, possesses ample strength to perform heavy duty work, and is supplied with 8 ft. 10 ft. and 12 ft. lengths of bed.



17-IN. PLAIN CHANGE ENGINE LATHE.

Special attention has been given to the construction of the bed which is of 20 per cent. steel mixture, and is stiffened by double wall cross girts. Chilled vees are provided which confine the majority of the wear to the carriage, the vee for the carriage being $2\frac{1}{2}$ in. wide.



TOOL-ROOM GRINDER.

The compound rest is of rigid construction and has a circular swivel graduated in degrees. Full length taper gibs with end screw adjustment are fitted on both cross and compound rest slides.

An offset of 1 in. back of the centre line is given to the headstock so as to bring the pressure area more completely over the bed which is especially desirable in high speed heavy duty work.

The spindle is made of 50-point carbon steel, is provided with a 1 9-16 in. hole, and runs in phosphor bronze bearings, the front one being $5\frac{1}{2}$ in. dia., by $3\frac{1}{2}$ in. long, and the rear one $4\frac{1}{8}$ in. dia. $\times$ $2\frac{1}{2}$ in. long. A three-speed belt cone is used which with the back gear gives 6-spindle speeds ranging from 13 to 360 per min.

A one-piece apron is grooved, pinned and bolted to the carriage, and has a bearing for both ends of all gears. The lead screw is 40-point carbon steel, 1 7-16 in. dia. by 2 threads per in. A rigid type of tailstock is employed having short clamping bolts, and a double plug binder which maintains the alignment of the spindle when tightened.

The principal dimensions of the 17 in. lathe are as follows: Swing over shears 19 in.; swing over carriage, $11\frac{1}{4}$ in.; length betwen centres, 8 ft. bed, 48 in.; tailstock travel, 8 in.; and No. 4 Morse taper centres. The weight of these lathes is 3,500 and 3,700 lbs. respectively for the 17 in. and 19 in. sizes.

BUNDLING PRESSES FOR SCRAP METAL

THE prolonged activity in the engineering and metal industries brings with it many problems for the works engineer, not the least troublesome of which is the manipulation and disposal of the large quantity of scrap metal which so quickly accumulates. This scrap was bundled, but the old-fashioned way of hand bundling is totally inadequate to deal with the situation under the present conditions. Hydraulic power has now been found to be the most efficient and economical method of bundling the metal ready for re-melting or for handing over to the dealers.

Very successful bundling presses on the market are those made by Hollings and Guest, of Birmingham, England, who have specialized in this class of machinery. Three designs of presses are represented, one for bundling brass, copper, or aluminium; one for dealing with wrought-iron scrap and clippings; and another for briquetting swarf and borings. Since the outbreak of the war these machines have been installed by numerous munition works, metal rollers and scrap merchants, repeat orders having been received in several cases. There has also been a large demand for these presses from the French munition and ordnance works.

SLIP RING INDUCTION MOTOR

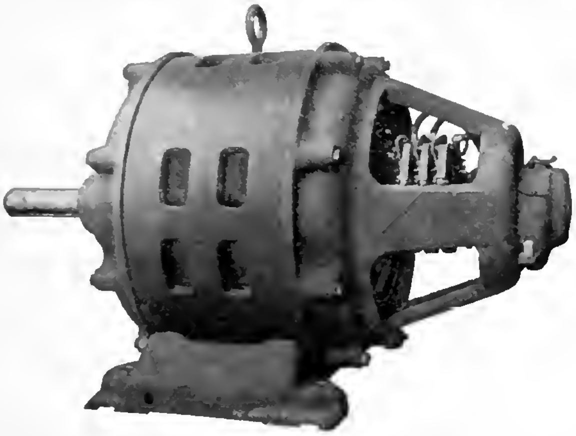
A NEW line of slip ring induction motors, (type CI) for severe, intermittent, varying speed service has just been developed by the Westinghouse Electric & Mfg. Co., of East Pittsburgh, Pa. These motors are especially designed for heavy duty on cranes, hoists, draw bridges, roller lift bridges, railway turntables, transfer tables and similar applications. They can be furnished in sizes from $1\frac{1}{2}$ to 200 horse-power for operation on two or three-phase, 220 or 440-volt, 25 and 60-cycle circuits.

10 HORSE-POWER MOTOR WITH BUILT-UP FRAME.

The frames of the smaller sizes are made up of steel laminations riveted between forged steel end shields; in the larger sizes the frames are made of rolled open-hearth steel. The brackets are of cast iron with reinforcing ribs to assure rigidity and perfect alignment of the bearings at all times. The bearings are self-oiling of the oil-ring type, and are large in size. The steel brush holders are supported by and insulated from

the bracket, which is open to permit easy inspection and renewal of these brushes.

The rotor is small in diameter, thus reducing the fly wheel effect. This feature, together with perfect balance and secure attachment of the windings,



75 HORSEPOWER MOTOR WITH ROLLED STEEL FRAME.

makes these motors especially adapted for frequent starting, stopping, and reversing. The shaft is of axle steel and can be removed from the rotor without disturbing the windings.

The running torque of these motors is the maximum obtainable and the starting and pull-out torques in all motors exceed twice full-load torque. They are so constructed, that in case of accident, repairs can be quickly made, and maximum strength is obtained while weight and overall dimensions have been reduced to a minimum.

The illustrations show a 75 horse-power motor, with rolled steel frame and a 10 horse-power motor with built-up frame construction.

MAMMOTH CONVEYOR BELT

CONFRONTING a sugar refining company some ten years ago was the problem of catching and carrying 125 pounds in a lump from a fall of 4 feet, at the rate of 3,200 per day. The solution of the problem was arrived at in the form of a 36-inch, seven-ply belt, which was installed at that time. Since its installation it is estimated that the belt has carried over 2,000,000,000 pounds of sugar before exhibiting any signs of wear. True, the belt is an enormous one and represents a large investment, but the service it has rendered is said to have exceeded all expectations. Recently, the same refinery installed a belt 1,443 feet long, 36 inches wide and weighing 11,983 pounds.

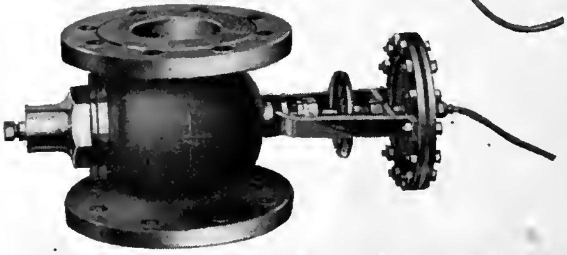
It is claimed that, estimating eight hours run without any delays, a bag of sugar will drop into the belt every nine seconds; and if the speed of the belt is such that it can make 26 to 27 revolutions every eight hours, the bags will rest at intervals of 12 feet apart. At this given speed, therefore, the belt will carry a continuous load of 60 bags or 7,500 pounds, and every nine seconds its heavily burdened surface will receive the sudden jolt and strain caused by 125 pounds dropping 4 feet.

CONTINUOUS FEED WATER REGULATOR

THE feed water regulator shown in the accompanying illustration is designed to regulate the supply of feed water to a boiler in exact proportion to the rate of evaporation, thus enabling the boiler to deliver a steady supply of steam according to the degree of heat maintained in the furnace.

No exhaust steam is discharged by this regulator which avoids the loss due to the use of live steam and its ultimate loss in the ash pit.

As a result of the absence of moving parts the S-C Feed Water Regulator is not subject to wear, and the absence of any necessity for replacement insures a long life for the apparatus.



VIEW OF REGULATOR ABOVE CONTROLLING VALVE ON FEED WATER PIPE

The S-C Regulator Co., Fostoria, O., state that because of its simplicity the device can be installed in about two hours.

FAST AND LOOSE PULLEYS

IN places where high speeds are used, if the loose pulley is simply faced square and bored out true in the way adopted in many works, there is a tendency to score and cut the shafting, and while this may not be dangerous on a good fibrous piece of metal, it is not too safe where metal is used which is liable to crystallize when fatigued is used. Outside any chance of danger, however, shafting which is scored is often awkward to deal with should alterations be needed, and if preventable the scoring should be avoided. To prevent trouble caused by the boring of the loose pulley itself, the edges of the boring should be rounded off and the cuts made should be finished smooth.

In a general fit up of a pair of pulleys, the keyway should not extend beyond the edge of the fast pulley next the loose one, as this last pulley should run on quite round shafting, especially where there is much dirt flying about. The collar should fit well and the set screw should not project above its surface, one of the many makes of safety collar or screw only being used. In fact, with all collars and similar projections from revolving machines there should be nothing to catch in the clothing of the persons employed on and around them. From time to time it is desirable that the collars shall be slacked and the loose pulleys run back and cleaned as well as the part of the shaft on which they run, as it not infrequently occurs that oil and dirt accumulates in the form of ridges, which are not beneficial to the working of any parts of machinery. Of course, some kinds of work are worse than others for free moving parts, but in all factories where much work is done, dirt and dust is unavoidably produced, and this is carried about by the air.

Varnishing Patterns. — A well-made pattern should be smooth, free from soft spots caused by the use of soft putty, and, above all, it should be impervious to moisture, or it will "suck" the mould and be hard to lift. To keep patterns in good order, they should be dressed with patternmakers' smooth shellac varnish as often as necessary, and in all cases it should be borne in mind that the smoother the pattern the smoother the casting produced from the mould. Where for any reason Plaster-of-Paris moulds are used, these should be dried and warmed, and then have their surface soaked with melted paraffin wax, to prevent absorption of moisture. Plaster patterns treated in this way brush up with a smooth surface, and for many purposes they answer as well as wood, while costing, in comparison, a mere trifle.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. JUNE 8, 1916 No. 23

A BOOST FOR CANADIAN SHIPBUILDING

THE North Sea battle, among other things, should give a decided impetus to the encouragement and development of shipbuilding in Canada. An appreciable dent has been made in our naval fighting machine, more so than any of us were prepared for, and while the ultimate ability of the latter to maintain its superiority is well beyond question, we may not be insensible to the fact that any immediately projected mercantile shipbuilding programme in Great Britain has received a substantial setback for some time to come.

It would be well for our Canadian business and public men to ponder over not only the recent happening, but to become awake to the fact that it is not by any means the last of its kind. There is a meantime serious shortage of merchant shipping the world over, and, while the war lasts, the shortage volume in the nature of things cannot but increase. However much we may desire it otherwise, there must also ensue a diminution of our naval fighting strength from time to time, and to readjust same it is readily apparent that Government control of British shipyards will continue effective.

As hinted in Sir Robert Borden's speech at the launch, the ice-breaker "J. D. Hazen" is to be pressed into service on behalf of the Allies. She, in a word, is to be diverted from her original purpose, and, in so determining, our action is altogether praiseworthy; but why stop there? In the case of the ice-breaker disposal we have undoubtedly made a sacrifice, for we had looked forward to her work on the St. Lawrence as influencing our trade and commerce to a material extent. On the other hand, the development and encouragement of shipbuilding on our ocean waterways and ocean shores would essentially be void of sacrifice, while the resultant product would be equally and perhaps more valuable to our Allies, and at the same time of untold benefit to ourselves, industrially and commercially.

We are disposed from a study of the facts and otherwise, available, to credit our North Sea enterprise as a display of reckless daring. The sacrifice in men and machines may, however, have been warranted; in any case only one fleet kept to sea, and that was Britain's. The responsible Government of Canada in this time of stress is well and far removed from any imputation of daring — without the reckless qualification, so much so that no little popular satisfaction would be felt were the lifeless inactivity replaced by even the slightest evidence of awakening interest in a Canadian shipbuilding programme.

The prophecy that with the lapse of some fifteen or twenty years hence, shipbuilding costs as between Great Britain and Canada will be equalized, smacks of the "Live horse and you'll get oats" wheeze, on which account alone it is absurd, while in the light of present-day conditions it indicates a rank ignorance of men and things. The cost of merchant shipbuilding in Great Britain is now higher by far per ton than it ever has been in Canada, and irrespective of the contrast between the two countries in pre-war days, it has to be borne in mind that in the new order of things, existent, and sure to prevail in post-war days, it is odds on a bet whether the cost difference will be other than negligible.

Being misinformed or uninformed is no excuse for the neglect of Canada's public business by her public men, the opportunities from within and from without to be otherwise, being readily available.

REVISING LARGE SHELL SPECIFICATIONS

CONSIDERABLE interest has been aroused in manufacturing circles by the announcement of impending changes in large shell specifications, and until a final decision is made, it will not be possible to arrive at an accurate estimate as to the effect of such changes on the rate of output or on the cost of the shells.

It would seem not unlikely that such changes as may be made will be for the purpose of lowering production costs, increasing output, or bringing about some desirable improvement in the construction of the shell as dictated by extended use in action.

Published accounts of large shell-making in Britain which have appeared in this and other engineering journals, have shown shell forgings of parallel diameter, necessitating a subsequent nosing or bottling operation. Up till now, forgings produced in this country have been made with a closed nose, the curve being formed by the die in which the billet is pierced and forged to size, it being possible to do this work in a single operation. Suitable machines and tooling outfits have enabled these curved surfaces to be finished with a high degree of accuracy and expedition, access to the interior being had through the open base.

The use of forgings of the open mouth closed base type as foreshadowed by present advices, while involving the discarding of some tooling outfits, should not necessitate sufficient change in machines to cause any apprehension amongst makers of larger shells. It is more than likely that improvements in nosing or bottling equipment will enable the curve of the shell to be formed with sufficient accuracy to dispense with a subsequent final cut on the inside.

While a decision regarding a closed base is still pending, the arguments in its favor seem to justify its adoption, the saving in expense and labor over the open base being more than sufficient to offset the expense of tool replacement, although the feature of additional safety under firing conditions may ultimately be the decisive factor in the problem.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 70	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	

	Montreal	Toronto
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Hamilton, No. 1	$26 00	$24 00
Hamilton, No. 2	26 00	24 00
Victoria, No. 1	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base, Toronto	3.00
Steel bars, base, Toronto	3.25
Steel bars, 2 in. and larger, base	5.25
Iron bars, base, Montreal	3.00
Steel bars, base, Montreal	3.25
Twisted reinforcing bars, base	3.30
Bessemer rails, heavy, at mill	2.50
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	...
F.O.B. Toronto Warehouse.	**Cents**
Steel bars, base	3.10
Small shapes	3.75
F.O.B. Chicago Warehouse	**Cents**
Steel bars	3.10
Bars, 2 in. and up	4.00
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper, carload	$32 00	$31 50
Electrolytic copper	32 00	31 25
Castings, copper	31 00	31 00
Tin	48 00	51 00
Spelter	19 00	19 00
Lead	9 25	9 25
Antimony	36 00	36 00
Aluminum	68 00	64 00

Prices per 100 lbs.

BOILER PLATES

	Montreal	Toronto
Plates, 1/4 to 1/2	$4.25	$4 25
Heads	4 50	4 50
Tank plates, 3-16 in.	4 75	4 75

WROUGHT IRON PIPE

Prices in effect April 26, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 06	5 31
1/2 in.	3 91	6 08
3/4 in.	4 72	7 65
1 in.	6 97	11 31
1 1/4 in.	9 43	15 30
1 1/2 in.	11 28	18 29
2 in.	15 17	24 61
2 1/2 in.	23 99	38 90
3 in.	31 37	50 87
3 1/2 in.	37 72	61 18
4 in.	44 69	72 49

Lapweld

	Black	Galv.
2 in.	$17 02	$26 46
2 1/2 in.	25 16	40 07
3 in.	32 90	52 40
3 1/2 in.	39 56	63 02
4 in.	46 87	74 67
4 1/2 in.	57 15	90 81
5 in.	66 60	105 82
6 in.	86 40	137 28
7 in.	116 62	179 70
8 in. x 25 lbs. per ft.	122 50	188 75
8 in. x 25 lbs. per ft.	141 12	217 44
9 in.	169 05	260 48
10 in. x 32 lbs. per ft.	156 80	241 60
10 in. x 40 lbs. per ft.	201 88	311 06

List for Ontario, Quebec and Maritime Provinces

OLD MATERIAL

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 00	$17 00
Copper, crucible	20 50	20 50
Copper, heavy	20 75	21 75
Copper wire	20 75	21 75
No. 1 machine compos'n	16 00	16 00
No. 1 compos'n turnings	13 75	13 75
New brass clippings	15 25	15 00
No. 1 brass turnings	12 00	12 00
Heavy melting steel	9 00	9 50
Boiler plate	11 75	10 50
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	11 50	10 00
Stove plate	10 50	10 50
No. 1 machin'y cast iron	14 75	14 50
Heavy lead	5 75	7 00
Tea lead	5 75	6 00
Scrap zinc	12 00	13 00
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Coach and lag screws	50
Stove bolts	62 1/2
Plate washers	25
Machine bolts, 3/8 and less	40
Machine bolts, 7-16 and over	30
Blank bolts	30
Bolt ends	30
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in.	$3.75 per lb. off
Nuts hex., over 1 in.	$2.00 per lb. off
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	37 1/2
Boiler rivets, base 3/4-in. and larger	$4.85
Structural rivets, as above	4.75
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS

	Per Cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	50
Finished Nuts over 1 in.	37 1/2
Semi-Fin. Nuts up to 1 in.	50
Semi-Fin. Nuts over 1 in.	37 1/2
Studs	45
Taper pins	.65
Coupling bolts	net
Planer head bolts, without fillet	.15
Planer head bolts, with fillet	net
Planer head bolt nuts up to 1 in.	.60
Planer head bolt nuts, over 1 in.	.55
Planer bolt washers	list plus 10
Hollow set screws	list plus .20
Collar screws	list plus .20
Thumb screws	.20
Thumb nuts	.75

BILLETS

	Per gross ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES

Standard steel wire nails, base	$3 70	$3 40
Cut nails	3 40	3 40
Miscellaneous wire nails		65%
Pressed spikes, 5/8 diam., 100 lbs.		$3 90

MISCELLANEOUS

Solder, guaranteed	0.31
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	3.00
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medal, per lb.	0.18
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls., gal.	0.68
Linseed oil, raw, single bbls.	0.80
Linseed oil, boiled, single bbls.	0.82
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Packing, square headed	0.25
Packing, No. 1 Italian	0.30
Packing, No. 2, Italian	0.23
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per Cent.
Standard drills to 1½ in.	45
Standard drills over 1½ in.	5
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	net
Bit stock	55
Ratchet drills	net
Machine bits for wood	15
S.S. drills for wood	45
Wood boring brace drills	25
Electricians	20
Sockets	30
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks ....list plus	5
Bridge reamers	55
Centre reamers	net
Chucking reamers	net
Hand reamers	5

High-speed drills up to 1½ in. and over 1½ in. Double list plus 20 per cent.

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60 per cent.; headers, 60; flanged unions, 55; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$4 15	$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 50
Canada Plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 75	7 75
Fleur-de-Lis, 28 B.W.G.	7 35	7 35
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	7 00	7 00
Premier, 10¾ oz.	7 30	7 30

PROOF COIL CHAIN

¼ in.	$9.45
5-16 in.	9.10
⅜ in.	8.35
7-16 in.	7.15
½ in.	6.95
9-16 in.	6.95
⅝ in.	6.80
¾ in.	6.70
⅞ in.	6.55
1 inch	6.40

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B.B

⅛ in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16 in.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	60-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	.....
1¼ in.	19 55	.....
1½ in.	19 55	12 70
1¾ in.	25 00	12 70
2 in.	25 00	14 00
2¼ in.	28 50	16 00
2½ in.	32 00	18 00
3 in.	40 00	21 00
3½ in.	45 00	25 00
4 in.	50 00	31 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 8.35
Galvanized, 24 wires, 1 in.	24.05
Black, 19 wires, ⅜ in.	6.90
Black, 19 wires, 1 in.	21.30

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and donble	40%
Standard	40 & 10%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun. Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun. Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto

WASTE

WHITE	Cents per lb.
XXX Extra	.16
Peerless	.16
Grand	.15
Superior	.15
X L C R	.14
Atlas	.14
X Empire	.13
Ideal	.13
X press	.12
COLORED	
Lion	.10¼
Standard	.9¼
No. 1	.9¼
Popular	.8¼
Keen	.7¼

WOOL PACKING

Arrow ....
Axle .... Prices on
Anvil .... application
Anchor..................

WASHED WIPERS

Select White ....
Mixed colored ....Prices on
Dark Colored .... application

This list subject to trade discount for quantity

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.37 to .39
Tin	.58 to .60
Zinc	.26 to .28

Prices Per Lb.

COPPER SHEETS

	Montreal	Toronto
Bars. ½ to 2 in.	$41 00	$41 00
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 in.	44 00	44 00
Copper sheet, tinned, 14 x 60, 14 oz.	46 00	46 00
Copper sheet, planished, 14 x 60 base	54 50	54 00
Braziers' in sheets, 6 x 4 base	43 00	43 00

BRASS

Brass rods. base ½ in. to 1 in. rd.	0.55
Brass sheets. 8 in wide 20 oz.	0.60
Brass tubing. seamless	0.55
Copper tubing. seamless	0.55

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

RUBBER BELTING

Standard	50%
Best grades	30%

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy	.35
Copper sulphate	.15-24
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, June 5, 1916.—Industrial activity throughout all branches of metal trades continues. Many firms are experiencing considerable difficulty in securing and retaining suitable help for the operation of their factories. This in many instances has resulted in increased wages, which, added to the higher cost of raw materials and needed supplies, has materially affected the economic aspect of all lines of production. Additional orders for 6, 8 and 9.2-in. shells are continually being placed, and the necessary machinery for their production is being acquired as rapidly as possible. Domestic conditions are improving: but the excessive cost of material has much to do with the deferred activity in many lines of normal industries.

Steel

The general situation throughout the steel industry shows little change, and with mills and furnaces working to capacity on present and future orders, the market is inclined to remain stationary. Owing probably to lower ocean freight rates, the foreign demand for steel is constantly increasing. The domestic interests are suffering to a large extent, as they do not feel willing to place orders at the present high prices. Billets and sheet bars are firm, with deliveries improving. The demand for plates has been so heavy that many of the large mills are booked well into 1917. This condition also prevails in the sheet mills, and blue annealed and special sheets are in good demand. Galvanized sheets are in fair demand, but owing to the decline in spelter are inclined to weaken. Some of the mills are using all available steel in material that will return them the best profits. Railroad spikes are fairly active, and the same may be said of all bolts and nuts. Consumers of rivets are well covered, and present market is quiet. Following the recent activity in wire goods, the trade has become quieter; general conditions are unchanged, with prices firm in all lines.

Metals

The general market is in a rather turbulent state owing to the action of the British authorities in placing certain restrictions upon the purchase of copper and other metals. This may be followed by a readjustment of prevailing prices. Copper is quiet and easier. Tin is inclined to be dull and continues to decline. Spelter has experienced a sharp break in London, and is unsettled here. Lead is quiet, and has a tendency to become weaker. Unexpected supply of antimony has been the cause of recent weakness.

Copper.—The copper market is exceptionally quiet, and prices are inclined to be easier. Consumers are apparently well covered for early future requirements, and little interest is being shown even at shaded prices. Offerings of resale metal have resulted in a slightly weaker market, but with the exception of castings, the quotations are unchanged. Owing to the recent action of the British Government, dealings of a speculative nature are now prohibited. Hereafter all purchases made must be for metal to be used in the buyer's plant. This ruling also applies to copper imported from the States, and agencies can only buy and sell metal on consumers' orders. This feature of the London market may be followed by a readjustment of copper prices as well as other metals. Present quotations in London show a decline of £1 and £2 on spot and future standard, and £8 on electro copper, prices quoted being £120, £118 and £140 respectively. With the exception of castings, New York prices are unchanged, and are nominal at 28½c for lake, 28¾c for electrolytic, and 26⅛c for castings, the latter being a decline of ½c per pound. Foreign conditions have not yet affected the local situation, and dealers here report a firm but quiet market, with prices unchanged at 32c for lake and electrolytic, and 31c for castings.

Tin.—The market is very quiet: so much so, that even with marked declines very little business is being transacted: and the bulk of this only on substantial concessions by the sellers. Developments in England are causing considerable un-

easiness among certain dealers in metals, and further restrictions on trading may seriously effect these interests. The evident result of this recent action is reflected in the sharp declines on London quotations, which show a reduction on the week of over £7. Standard tin is now quoted at £185 15s. for spot and futures, and £186¼ for Straits tin. New York continues to weaken, and sufficient buying has not developed to arrest the decline. Should the market show any signs of steadying, it is thought by the trade that additional buying would develop, as future purchases have been very light for some time. On a decline of 2⅛ cents, New York is quoting 45¼ cents nominal. Dealers here report a quiet and unsettled market, with prices weaker; 48 cents is being quoted, a decline on the week of 1 cent.

Spelter.—The situation in spelter is very unsettled at the present time, owing to another sharp break in London market. No reason is given for the recent decline, and an interesting feature in connection with the present situation is the fact that present prices in London are now below those in New York, which for many weeks have been much the other way. Consumers' inquiries are fairly good, but in face of the latest developments it is doubtful if much business will be closed until the present situation becomes clearer. A decline of £20 on spot and £15 on futures puts present quotations on the basis of £70 and £60 respectively on the London market.

Until further information is available, the New York market will hold firm on their current quotations. Present prices of 13 cents shows a decline of 1 cent on the week. The local situation is slightly easier, but quiet; dealers report a decline of ½ cent, and are quoting 19 cents per pound.

Lead.—The market is dull and, in the face of light inquiry, prices are inclined to become easier. Domestic requirements are also light, and the trade is expecting to see a decline in early future quotations. Outside interests are a little below the Trust prices, and as the supply appears to be fully equal to the demand, it is more than likely that lower prices will prevail in the near future. London reports a fair market with slightly stronger prices, but conditions here tend to become easier. The local situation is unchanged, and prices are firm at 9¼ cents per pound.

Antimony.—The situation continues to weaken and further declines are reported. The cause of the recent falling off in the price of antimony is largely owing to the cancellation of considerable Russian business, which has resulted in large quantities of Japanese metal being placed on the market. The effect of this unlooked-for supply has been shown in the recent break. However, it is reported that this metal is now being withheld from the market, and a steadier tone may be expected. A decline of 2 cents is noted in the New York prices, which are quoted at 25 cents. Local dealers are quoting 36 cents, being a decline on the week of 2 cents per pound.

Aluminum.—Conditions are comparatively unchanged, with prices steady at 68 cents per pound.

Machine Tools and Supplies

Conditions throughout the machine tool industry continue to maintain a fair degree of activity, but the demand for shell making equipment (especially of the smaller sizes) is now confined to individual machines. The requirements for the heavier shells, however, continue to keep the machine tool builders busy, and a considerable volume of business in this direction is everywhere evident. Delivery on machines is improving, and delays, owing to non-shipment, are becoming less frequent. The small tool and supplies demand is easing up a bit, and a feeling of relief is prevalent in many lines.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Old Materials

The trade in scrap metals, while still of considerable volume, is nevertheless quieter than for some time, and prices are becoming weaker. Quotations, however, are still nominal at last week's figures, with the exception of zinc scrap, which is quoted at 12 cents, a decline of ½ cent.

Toronto, Ont., June 6.—Trade conditions continue favorable as regards the volume of business moving but the shortage of raw materials and labour are causing considerable anxiety to manufacturers. This is true particularly in the case of iron and steel, as the mills are getting more backward on deliveries owing to the heavy demand. Reports from London, England, indicate that the Export Association of Canada is doing some very effective work and their connection is being considerably extended. The Customs returns continue to show increases. The Dominion revenue for the month of May totalled $13,054,381, and represented an increase of $5,738,457 over the corresponding month of last year. The revenue for the port of Toronto for May amounted to $3,092,538, being an increase of $1,607,294 over the corresponding month of last year, thus establishing a record for the total revenue.

The steel market is steadier and quotations are very firm although the upward tendency is less pronounced than it was. The mills continue to operate at capacity with sufficient business on hand to carry them well over into 1917. The weakness in the ingot metal markets continues and prices on a number of metals have declined. Copper, however, although dull is unchanged, and prices are holding firm. There is nothing in the scrap metal market to call for any particular comment. The market is weaker and some metals have declined.

Steel Market

The upward movement in prices is less pronounced, the market being much steadier and still very firm. The general situation, however, is unchanged and the present high level of prices will, no doubt, obtain for some considerable time. The demand on the mills for material is as insistent as ever and there is no sign of any falling-off in demand. There is, therefore, little possibility of any weakness developing in the market with a continuance of present conditions. Deliveries are as backward as ever and are a serious handicap to many makers of finished products; the result being continued high prices and a shortage of many lines. The most important advance this week is in seamless boiler tubes, prices being about 5 per cent. higher for most sizes. The mills are practically sold out for the remainder of the year on both iron and steel locomotive and merchant tubes. The market is very strong and a further advance is expected in the near future. Prices on wrought iron pipe are very firm and an advance is highly probable at no distant date on account of the shortage of skelp. It is reported that many skelp mills have their output sold up for practically the remainder of the year. Boiler plates are also very firm and deliveries backward, some plate mills are sold up for the remainder of the year.

The sheet market is very firm; prices on black sheets have an upward tendency, although galvanized are easier. Light black sheets continue to be readily obtained while heavy gauge as well as blue annealed are as scarce as ever. The continued decline in spelter has had its effect on galvanized sheets, but the price of this metal is still too high and the market too unsettled to materially benefit the galvanizers.

The high level of prices in the United States is being well maintained and the

steel market is very firm. New orders are not in such large volume but there is no sign of weakness in the market. The outlook in the steel trade continues very bright and the mills are booking orders into the second quarter of 1917. Steel bars are unchanged at 3c, plates 3.75c, and shapes 2.60c, Pittsburgh.

Old Materials

The market for scrap metals has a weak tendency and prices of some materials have declined. The domestic demand is light but the manufacture of munitions is still absorbing considerable quantities of some metals. Lower prices have to be noted for copper ,brass, heavy melting steel, lead and zinc.

Machine Tools

The orders for heavy duty lathes reported in these columns last week as pending, have been held up temporarily. Changes in the method of making the 8 in. and 9.2 in. high explosive shells are under consideration involving a considerable difference both as regards forging and machining from the practice which is being followed at present. When the question is settled it is expected that there will be some nice orders placed for large-swing lathes. Deliveries on single purpose lathes are good, but, on standard tools, slow. A better demand for woodworking machinery is reported but the ordinary business is comparatively quiet.

Supplies

Business continues good and the market steady but firm. The upward movement in prices is slowing down, indicating that the prices on finished products are more or less adjusted in line with the cost of raw materials. The price changes this week include "Trimo" and "Stillson" wrenches which are now quoted at a discount of 55 per cent. as against 60 per cent. formerly. Wood pulleys now carry a discount of 50 per cent. Linseed oil has declined again and is quoted at 80c for raw, and 83c for boiled oil, per gallon.

Metal Markets

The decline in prices of metals continues, copper being the only one not affected. The lower prices are due to a general decline in London, where the market has been affected by peace rumors. As the possibility of an early peace is remote, the market should recover and a re-action set in. The copper market is steady due to the recent order of the British Government, now in effect, prohibiting speculation in copper. The tin market is dull and stagnant, and prices have declined. Spelter is also lower and the market disturbed, following sharp decline in London. The "Trust" price for lead is unchanged but the outside market is lower. Antimony and aluminum are weaker and prices have declined. Solders are unchanged.

Copper.—The market although dull has not followed the weakness in London, quotations and prices being unchanged. Consumers generally are displaying but little interest, and producers are not pressing copper on the market. The undertone is very strong with the view is generally held that it is simply a question of awaiting the next buying movement. Quotations are unchanged and nominal at 31½c per pound.

Tin. — The market is quieter with quotations slightly lower. Consumers are still holding off but some good buying is expected as soon as the market shows signs of steadiness. The position of tin is a good one and it is selling at a low basis compared with other metals. Tin has declined 1c and quotations are nominal at 51c per pound.

Spelter.—Quotations continue to decline and the market is unsettled following a sharp break in London. It is probable that a re-action will set in and prices advance. Local quotations are lower at 19c per pound.

Lead.—The market is dull and lower on the outside market but the "Trust" price of 7.50c New York is maintained. The demand continues light and buying at present is of a hand-to-mouth order. Local quotations are a shade lower at 9¼c per pound.

Antimony.—The market is unsettled and lower due to an increase in available supplies. Quotations are nominal at 38c per pound.

Aluminum.—The situation generally is unchanged but the market is weaker and quotations have declined to 64c per pound.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

RUSSIAN TRADE WITH UNITED STATES

H. BUNNELL, has resigned from the Griscom-Russell Co., with whom he has been in an engineering and sales capacity for the past nine years, and has become chief engineer of R. Martens & Co., Inc., the New York connection of R. Martens & Co., of London, of which David A. Thomas (Lord Rhondda) is president, and Richard Martens, a Russian by birth and citizenship, is vice-president and general manager. The firm has it own pier on Staten Island, and will operate a line of steamships to Russian points after the close of the war.

In preparation for the extensive business which will be done between Russia and the United States, the Russian branches are investigating the conditions in the engineering and agricultural fields through a force of English and American engineers who will spend the next six months in Russia. The New York house will carry on the work of arranging to represent American manufacturers in Russia and of transmitting information, prices and descriptive matter through the Russian office. Catalogue descriptions of various American lines are being put into Russian, and at Petrograd an extensive loose leaf catalogue will be issued. The Russian branch houses are at Petrograd, Vladivostok, Moscow, Archangel and other branches will be established at Odessa, Tomsk and Baku.

"SOO" CANAL TRAFFIC

THE statistical report for May of traffic through the canals at Sault Ste. Marie, Michigan and the Sault, Ontario, shows the heaviest traffic for one month yet received; 10,164,562 tons passed through the American Canal, and 2,128,-914 through the Canadian.

Iron ore, grain and wheat continue to head the shipping list, showing a tremendous increase over May of last year of the former. May, 1915, showed a 4,-906,788 tons, as compared with 8,144,555 tons in 1916; grain, 5,497,071 in 1915, against 15,837,114 in 1916; wheat, 13,-267,497 in 1915, against 37,333,403 in 1916.

Soft coal also shows an increase—1,248,447 tons in May of last year, and 2,075,552 this year: 1,756 passengers passed through on steamers, an increase of 412 over May last year; 3,215 vessels were locked through, 776 of them through the Canadian Canal. The tonnage locked through the canal for the past month was more than the total amount handled in a season through the canals 24 years ago. Of iron ore, nearly

twice as much was handled last month as in that year, and 82,646 tons more than in the entire year of 1895. As many lockings were made during May as in 1894.

RUSSIAN ENQUIRY FOR LOCOMOTIVES

THE Russian Ministry of the Interior has sent out an enquiry for from 600 to 1,000 large locomotives. The exact number to be purchased is not stated, but it is expected that a portion of the order will be divided between the American Locomotive Co. and the Baldwin Locomotive Works. Last year an inquiry from the same source for from 400 to 600 locomotives resulted in the placing of orders for 350 engines in the United States, and 50 in Canada. In consequence it is thought that about 500 engines will be placed with American concerns, and 100 in Canada, for the current inquiry.

The engines are to be of the same type as those ordered last year, and will cost somewhere between $27,000 and $30,000 each probably nearer the higher figure. The money total of the order, if 500 locomotives are purchased, will be about $15,000,000. One advantage lies in the fact that the type is unchanged so that it will not be necessary to make new patterns, usually an important item of expense.

ITALY'S METALLURGICAL FUEL REQUIREMENTS

OWING to the coal shortage in Italy, due to reduced imports, the Associazione degli Industriali Metallurgicai Italiani has emphasized the necessity of a regular supply to metallurgical and engineering works so that the interests of natural defence may be safeguarded. Three grades of coal are particularly mentioned: Steam coal, such as Cardiff and others; gas-producer coal for open-hearth furnaces, chiefly Scotch coal, splint, etc., and reheating furnace fuel, usually the splint class or New Pelton. The normal annual fuel requirements of the chief works are as follows: Blast furnaces, 800,000 tons of coke; open-hearth furnaces, 300,000 tons of coal; reheating furnaces, 40,000 tons of coal; boiler furnaces, 510,000 tons of coal; foundry cupolas, 50,000 tons of coke; foundry boilers, 50,000 tons of coke; works producing wire and other finished steel, 100,000 tons; brass, copper and lead foundries and smelting works, 30,000 tons of coal, and 50,000 tons of coke; machine shops, 100,000 tons of coal.

CUSTOMS REVENUES

THE Customs revenue of Canada for the first two months, April and May, of the fiscal year show an increase of nearly ten millions of dollars. The revenue for the month of May accounted for the larger proportion of this increase, the Customs collections reaching a total of $13,054,381, as compared with $7,315,923 for the corresponding month in the previous fiscal year, an increase of $5,738,457.74.

The returns are regarded as highly satisfactory as the figures include drawbacks on re-exported munitions and similar commodities.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Montreal, Que.—The British American Oil Co. will make an extension to their plant at Outremont.

Guelph, Ont.—F. Callandar will shortly begin the construction of a foundry here to cost about $7,000.

Quebec Bridge Progress.—The middle span of the Quebec Bridge will be in place this summer, or in the early fall, completing the shore-to-shore steel of the world's greatest bridge.

Calgary, Alta.—The Threshing Machine and Tractor Co. announces that it will start the erection of a new plant here in August. Plans are now being prepared.

Ontario Mining Room.—The value of the production of metalliferous mines and works in Ontario in the first three months of 1916 is $14,276,382, as compared with $9,358,210 for the corresponding period last year.

Tillsonburg, Ont.—The Tillsonburg Metal Stamping Co., which was established here some months ago by J. C. Inman, has been taken over by the Chatham Malleable Steel Co.

General Industrial

tor at Kelsey has been destroyed by fire.

Lindsay, Ont.—Horn Bros. will proceed with the construction of a woolen mill. The cost will be about $25,000.

Montreal, Que.—The Marcus Loewe Co. will build a large theatre here. The Fleischman Construction Co. are the general contractors.

Regina, Sask.—The Canadian Consolidated Rubber Co., will build a warehouse here to cost about $24,000.

Wallaceburgh, Ont. — Several thousand dollars damage was done at the Dominion Glass Co. plant recently by the bursting of a furnace containing molten glass.

Sarnia, Ont.—A stone-cutting plant is likely to be erected in Point Edward, with a capitalization of $100,000. The stone from Indiana for the new Union Station at Toronto will be worked up at this plant. George Oakley & Son, of

Calgary, Alta.—The North Star eleva-

Markham, Ont.—A new company, composed of prominent business men of this district, intends to build one of the largest and most modern mills in York County. It will be situated at Markham Station, and the cost is estimated at $60,000. The chief stockholders are A. W. Milne, proprietor of Milne's mill, D. E. Jones, and J. Schurr.

Medicine Hat, Alta.—The Lake of the Woods Milling Co. has let the contract for the building of a mill to replace that recently burned down. The new plant will cost approximately $200,000, and will have a capacity of from 1,500 to 2,000 barrels. In addition, the company will erect a number of elevators in the West this year.

Municipal

Warwick, Ont.—A proposal is under consideration to instal a Hydro-Electric system in Warwick Township.

Preston, Ont.—The town council will shortly submit a by-law to authorize the expenditure of $10,000 on a fire engine.

Almonte, Ont.—The Town Council is considering the question of adopting Hydro-Electric power. An up-to-date system would cost about $18,000.

Markham, Ont.—The waterworks here are being enlarged so that the village may supply Mount Joy and Vinegar Hill. The contract has been awarded to a Toronto contractor, and mains to the two villages are now being laid. In one case it will be necessary to lay over two miles of main.

Sarnia, Ont.—The city has taken over the power plant and lines of the local electric company, and will operate it until Niagara power arrives in a couple of months. The plant costs Sarnia $180,000, and will be changed from a 60-cycle to 25 as soon as the Hydro arrives. The Hydro transmission line is now nearing Sarnia.

Hull, Que.—A by-law authorizing the purchase of a combination motor pump, hose and chemical motor truck; also about 1,500 feet of hose, and to extend the water works to Tetreaultville was passed by a large majority. The by-law calls for the expending of about $140,000, of which from $13,000 to $15,000 will be allocated to the purchase of motor apparatus.

Tenders

Ottawa, Ont.—Tenders will be received up to June 17, 1916, for the construction and erection of viaduct, station and train shed at Levis, P.Q. Plans, specifications and blank form of contract may be seen at the office of the chief engineer, Department of Railways and Canals, Ottawa, Ont.; at the office of the chief engineer, Moncton, New Brunswick; at the office of the resident engineer, Levis, P.Q., and at the office of Ross & McDonald, architects, Montreal, P.Q.

The Pas, Man.—Tenders, addressed to H. H. Elliott, M.D., secretary-treasurer of the Town of The Pas., Man., will be received up to June 22, 1916, for the supply and delivery of the following machinery and materials:—Tender "A"—For the supply and delivery of two sewage lift pumps. Tender "B"—For the construction of a sewage lift chamber. Plans and specifications may be seen at the office of Murphy & Underwood, consulting engineers, Saskatoon, Sask., and the resident engineer, The Pas, Man.

London, Ont.—Tenders for the erection of the new Technical and Art School on Dundas Street will be received till June 12, at the office of the secretary of the Board of Education. Plans and specification may be seen at the offices of the architects, A. E. Nutter, Dominion Bank Chambers, and Watt & Blackwell, Bank of Toronto Chambers. Plans for heating and ventilating and wiring may be seen at the offices of the above architects, or at the office of H. P. Elliott, heating engineers.

Railways—Bridges

The American Lead Pencil Co., New York, have prepared sample boxes of their "Venus" pencil, with pocket testing holder.

Savage Mills, Que.—A request has been made to the Provincial Government for a subsidy towards the construction of a permanent concrete bridge over the Yamaska River, at this place.

Winnipeg, Man. — J. D. McArthur, railway contractor has received a loan of $2,000,000 in connection with the construction of the Edmonton, Dunvegan and British Columbia Railway.

Vancouver, B.C.—Plans for the Canadian Northern passenger terminals on

About that Motor—

?

For the convenience of our customers we have anticipated to some extent the demand for Electric Motor Equipment and carry at Toronto a large stock of 3 phase, 25 cycle, 550 volt motors.

3 Phase
25 Cycle
550 Volt

No.	Type	H.P.	Speed R.P.M.	No.	Type	H.P.	Speed R.P.M.
1	CCL	20	1400	5	CCL	5	700
1	CCL	15	700	2	CCL	5	1400
2	CCL	10	1400	1	CCL	3	700
2	CCL	10	700	1	CCL	3	1400
2	CCL	7½	700	1	CCL	2	700
1	CCL	7½	1400	2	CCL	2	1400

Write us for Portable Electric Tools. Welders and Electrical Specialties of all kinds.

The A. R. Williams Machinery Co., Ltd.

64-66 Front Street West - Toronto If It's Machinery - Write Williams

Thousands of Threaded Pieces Each Day with a Geometric Threading Machine

RAPID AND PERFECT DUPLICATION

Takes floor space 2 ft. x 3 ft., and is complete with countershaft, change speed gear for adapting speed of spindle to diameter to be threaded; adjustable stop for gauging length of work.

No rough threads with the Geometric. They are as true and clean as can be produced by any screw machine.

Note the range:—Regularly, ¼-in. to ¾-in. Specially, ½-in. Std. pipe threads; ⅞-in. S.A.E. Std. Spark Plug threads, and up to 2-in. Diam. threads where the pitch is fine. Internal threads, ⅛-in. to 2-in.

Send in your Specifications and learn what we can do for you.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN, CONN., U.S.A.

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John. N. B.

False Creek will be completed this week and Vancouver contractors will be given an opportunity to figure on them early next month.

St. Thomas, Ont.—Work is progressing rapidly on the T., H. & B. railway line from Dunnville to Port Maitland, which is preparatory to the inaugurating of a car ferry across Lake Erie. The line, which is about five miles in length, was started about one month ago. The plans also included the building of a slipdock at Port Maitland.

Trade Gossip

The Automatic Paper Box Co., has increased its capital stock to $200,000.

St. John, N.B. — Development work has begun upon the tungsten mines near Burnt Hill, Northumberland County.

Mussens, Ltd., Montreal, have been awarded a contract for two gasoline-driven diaphragm pumps by the Board of Control, Toronto.

The Smart-Turner Co., Hamilton, Ont., have been awarded a contract for a high power duplex pump by the city of Toronto for the high level pumping station.

Prices Wanted.—A reader of Canadian Machinery is desirous of getting information as to where prices can be obtained on rawhide packing suitable for hydraulic pumps. Will someone oblige?

Victoria, B.C.—The Victoria & Island Development Association, the Manufacturers' Association, the Retail Merchants' Association and other kindred organizations propose to amalgamate with the Board of Trade in order to develop and encourage new industries.

St. John, N.B.—The Federal Government has decided to erect a million bushel grain elevator here in connection with the Canadian Government Railways system. It is expected that the first unit of 500,000 bushels will be ready for use the coming winter season.

Error in Advertisement.—Through a typographical error, part of the text of the Mackinnon, Holmes Co., advertisement on page 6 of our May 25 issue implied that "hydraulic press equipment for forging shell plugs was a product of that firm." It should have read that "their plant was equipped for forging shell plugs."

Victoria, B.C. It is said to be the intention of the Provincial Government to bring in a bill shortly making a special grant of $40,000 for the purchase of new machinery for the treatment of zinc ores at the experimental plant at Nelson. Some time ago the sum of $20,000 was expended on apparatus at Nelson for the treatment of ores providing for the removal and saving of zinc. Ores carrying zinc are penalized at refineries and any preliminary process which will remove the zinc without losing it will admittedly be of considerable value.

Ottawa, Ont.—The Public Works Department has under consideration the matter of the approval of plans for the construction of a canal between Lake St. Francis and Lake St. Louis by the Beauharnois Light, Heat & Power Co. The proposed scheme involves a considerable development and, in all probability, will eventually result in the closing of the Soulanges Canal, in which case navigation would be diverted to the new canal between Lake St. Francis and Lake St. Louis. The Soulanges Canal is only ten or twelve feet deep, while the proposed Beauharnois Canal would be twenty-two feet.

Ottawa, Ont.—The Dominion Government has appointed the firms of Marwick, Mitchell, Peat & Co., and Price Waterhouse & Co., as auditors of the C. N. R. and the G. T. P. R. systems respectively. The duties of these firms will be to make on behalf of the Government a continuous audit of the revenues and expenditures of the railway systems in question and report to the Government the result of such audit from time to time. The appointments have been made in pursuance of statements made in the House by the Finance Minister in connection with the legislation authorizing loans to these two railway companies.

Government Stands by Hydro Scheme.—The material setting forth the position of the Province of Ontario in regard to the diversion of water at Chippewa Creek for the proposed new hydro development has been sent by Hon. I. B. Lucas to Ottawa, where it will form the basis of the Dominion Government's reply to the objections raised by the United States Government recently. The Ontario Government has taken the stand that it is within its rights in diverting water from Chippewa Creek, but a detailed statement of the Government's answer will be left to the Federal authorities, in whose hands such international matters properly rest.

Trade After the War.—E. R. Stettinius, head of the export department of J. P. Morgan & Co., on his return to New York, after an absence of two months in Europe, is reported to have stated that most of the reconstruction of the European countries now at war will be done by themselves when the war is ended. Many of the large factories which have sprung up for the production of war munitions will be utilised for other purposes when the war is over; many of the men returning from the front will have to be given employment, and he did not anticipate any great influx of business to the United States in what he termed the work of reconstruction.

Personal

Chatham, Ont.—The Board of Trade are negotiating with a company who are looking for a site to establish a factory and may locate here.

James Carlton Eckliff, president of the Eckliff Automatic Boiler Circulator Co., died at his home, 30 Melbourne Ave., Detroit, Mich., on May 9.

H. A. Breckenridge, formerly with the Montreal Locomotive Works, Montreal, has become purchasing agent of the Lima Locomotive Corporation, Lima, Ohio.

Heineman Johnston, of Ottawa, the new Trade Commissioner to Bristol, England, who replaces E. D. Arnaud, who died recently, has entered upon his duties.

L. D. Wilgress, Canadian Trade Commissioner to Omsk, Siberia, has left for Petrograd. Mr. Wilgress will look after the development of Canadian trade in Siberia.

C. Lamont has left Weyburn, Sask., for Collingwood, Ont., where he has received an appointment as chemist in the munitions department of the Kennedy Steel Works.

John G. D. Cook, a draughtsman at the Kerr & Goodwin Works, Brantford, Ont., leaves shortly for Siberia, where he will represent a mercantile firm, reporting to it on business conditions.

Arthur Drummond, son of the late Sir George Drummond, of Montreal, died on May 29 at the Royal Victoria Hospital. The deceased, who was in his 48th year, was general manager of the Canada Sugar Refining Co., Montreal.

Harry C. Slemin, formerly advertising manager, Yawman & Erbe Mfg. Co., Rochester, New York, has been elected managing director of the Office Specialty Mfg. Co., Newmarket, Ont., to succeed J. F. Wildman, resigned. Mr. Slemin was born in Toronto in 1879.

Captain John Simpson, veteran Canadian navigator and shipbuilder, died on June 3 at this home, Owen Sound, Ont., in his ninety-first year. He was born in the Bay of Quinte district near Belleville. When twelve years of age he began his career as a sailor and visited many parts of the globe before the mast

on clipper ships. After he became captain he was master of sailing ships on the Great Lakes and had all the experiences which come to the navigators before steam supplanted canvas. During the winters he learned shipbuilding with his uncle, a notable shipbuilder of Oakville, Dennis Potter, and it was in the ships he built rather than the ships he sailed that he will fill a position in Canadian navigation affairs. He came to Owen Sound in the fall of 1874 to build the steamer City of Owen Sound for A. M. Smith & Co., who had purchased the burned hull and machinery of the City of London.

Contracts Awarded

Toronto, Ont.—The Canadian Bridge Co., of Walkerville, Ont., have been awarded a contract for 5,000 tons of structural steel for the new Union station here.

Regina, Sask.—The Canadian Consolidated Rubber Co. has awarded a contract for a warehouse, to cost about $30,000, to the Poole Construction Co., Regina. Alex. Melville is the architect.

Medicine Hat, Alta.—The contract for the erection of a flour mill for the Lake of the Woods Milling Co. has been awarded to Carter-Halls-Aldinger & Co., Winnipeg. Approximate cost $200,000.

St. John, N.B.—The City Council has awarded a contract to James Fleming for 20 tons of special castings, and a number of sewer manhole covers, vault covers, fireplug platform covers, catchbasin frames and basins.

Toronto, Ont.—The City Council have awarded the following contracts for parts necessary for the construction of civic cars as follows:—Bodies, Preston Car & Coach Co., Preston, Ont., price, each, $4,907; trucks, Dawson & Co., per set, $828.50; electrical equipment, Canadian Westinghouse Co., Hamilton, Ont., price, each, $1,866; wire and cable, Eugene F. Phillips Electrical Works, Montreal, per car, $123.17; fare boxes, Coleman Fare Box Co., each, $51.10. Thirteen cars are to be constructed, and the cost will be $112,066.

Wood-Working

New Westminster, B.C.—The Brunette Sawmills Co. will build a new dry kiln in place of the one recently burned, the cost is estimated at $4,000.

Memramcook, N.B.—The large woodworking factory and grist mill, belonging to John Gaudet, Memramcook, N.B., was destroyed by fire recently. The loss is estimated at about $20,000.

Building Notes

Sarnia, Ont.—The Schultz Co. of Brantford will build a new school here to cost $58,000.

Simcoe, Ont.—The Board of Education will build two new schools at a total cost of $40,000. Chapman and McGiffin of Toronto are the architects.

Selkirk, Ont.—A new school will be built here. Tenders will be received up to June 24, and full particulars may be obtained from the architect, A. W. Peene, Hamilton, Ont.,

Toronto, Ont.—The T. Eaton Co. propose erecting a factory on Alice Street and Downing Lane. The building will be 227 ft. by 165 ft. and 140 ft. high, having 12 storeys. It will be of reinforced concrete and brick construction, and will cost $625,000.

Parry Sound, Ont.—Tenders will be received up to June 12, 1916, for the erection and completion of a six-room school building to be built in Parry Sound, Ont., for the Parry Sound Public School Board. Plans and specifications may be seen at the office of the secretary-treasurer, Parry Sound, Ont., and at the offices of the architects, Angus & Angus, Angus Block, North Bay, Ont.

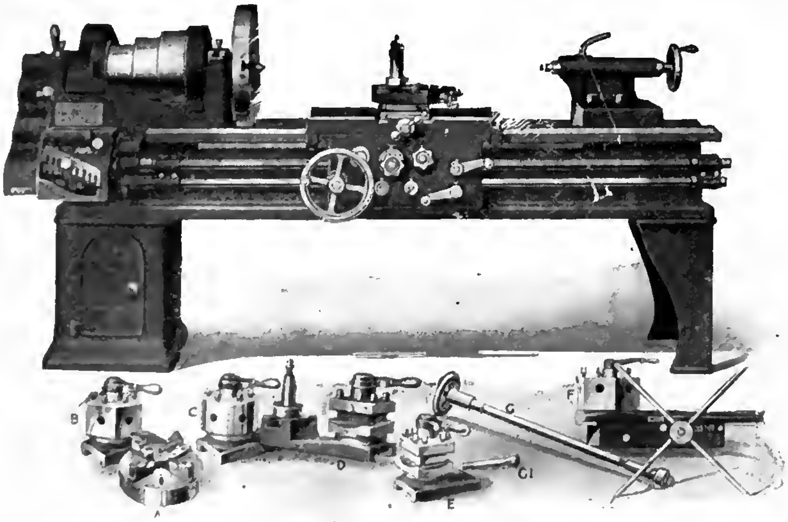
Marine

Car Ferry Sold.—The car ferry, Pere Marquette No. 5, which has been operated between Milwaukee, Ludington and Manistee for the past eight years by the Pere Marquette Line, has been sold to Sydney, N.S., interests, it is announced. The boat will be used on the Bay of Fundy.

Peace River, Alta.—The river steamer "D. A. Thomas" was launched here recently for service between Hudson's Hope and Vermilion, a distance of 600 miles. The steamer is 200 ft. long by 48 ft. beam, and is driven by a 700 h.p. steam engine. She is constructed of B. C. pine, cost $100,000, and has accommodation for 250 passengers.

New Docks for Windsor.—Plans have been submitted to the Canadian Marine and Fisheries Department by the Detroit and Windsor Ferry Co. for new docks at the foot of Ouellette and Ferry Avenues, at a cost, it is estimated, of from $125,000 to $150,000. Work will be started, it is expected, shortly if the Government accepts the present plans, with possibly a few minor changes.

Notice to Mariners.—The following notice to mariners has been issued by the superintending engineer of the Welland Canal:—"On and after the 1st June, 1916, and until further notice, no vessel



will be allowed to enter and pass down through the Welland Canal drawing more than fourteen feet four inches of water, and no vessel will be allowed to enter and pass up through the Welland Canal drawing more than fourteen feet of water."

Halifax, N.S.—It is reported that three shipbuilding concerns have sent inquiries to the Board of Trade as to the property and bonuses available for the erection of shipbuilding plants in this city. The matter will be taken up at once with these concerns, all of which are British. Halifax has been on record for years as willing to give a bonus to a steel shipbuilding plant, and a syndicate of local men is holding a valuable property for such a plant. The local Board of Trade has been advertising this in the British newspapers.

New Incorporations

The Macier Motor Car Co., has been incorporated at Ottawa with a capital of $750,000 to manufacture motor cars and trucks W. K. Cook, F. C. Virtue and F. J. Foley, all of Toronto

The Peerless Pulp Co., has been incorporated at Toronto with a capital of $30,000 to manufacture pulp and paper at Thorold, Ont. Incorporators, Edward P. Foley and J. M. Foley of Thorold, and H. A. Constantine of Niagara Falls, Ont.

The Elmira Planing Mill Co. has been incorporated at Toronto with a capital of $40,000 to carry on business as sash and door manufacturers at Elmira, Ont. Incorporators, W. J. Letson of Woolwich, Ont.; J. Banman and E. G. Martin of Elmira, Ont.

The Wright Furniture Co., has been incorporated at Toronto with a capital of $40,000 to manufacture all kinds of furniture. Head office to be situated at Port Arthur, Ont. Incorporators, W. A. Wright and W. F. Langworthy of Port Arthur, Ont.

The St. Mary's River Construction Co., has been incorporated at Toronto with a capital of $25,000 to carry on business as general contractors at Sault Ste. Marie, Ont. Incorporators, K. McKenzie Wright and J. A. McPhail of Sault Ste Marie, Ont.

The Sorel Shipbuilding & Coal Co., has been incorporated at Ottawa with a capital of $100,000 to carry on business as shipbuilders and repairers, etc., at Sorel, Que. Incorporators, W. H. McKeown, G. E. Chartand, L. C. Herdman all of Montreal.

The Henson Knitting Co. has been incorporated at Ottawa, with a capital of $50,000, to manufacture cottons, jutes,

silks, linens, hosiery, etc. Head office to be situated at Montreal. Incorporators: T. J. Coulter, W. S. Jones, and Richard Booth, all of Montreal.

Catalogues

The York Mfg. Co., York, Pa., have issued a bulletin dealing with their vertical shell and tube steam condenser for ice plants. Copies of the bulletin may be obtained from the Canadian Ice Machine Co., Toronto.

Electric Instruments. — Bulletin No. 100 describes a line of electrical instruments made by the Roller-Smith Co., New York, for signal system testing. Full particulars are given covering each type of instrument and a series of diagrams of facsimile scales are also included.

The Penberthy Injector Co., Windsor, Ont., have issued an engineer's ready reference book for the boiler and engine room. The book contains 21 pages and deals with the "Penberthy" line of injectors, lubricators, "Compodisk" valves, oilers, etc. Each type of apparatus is illustrated and described together with a price list and particulars of each size.

Manganese Chains.—The Jeffrey Mfg. Co., Columbus, Ohio, are now ready to distribute to the trade their latest Bulletin No. 171 dealing with manganese chains. This bulletin contains full details and prices of detachable, "Peerless" and "Hercules" types of manganese chains, sprockets, and attachments, which insure a maximum of elevator and conveyer service in aggravating cases of wear, where the conditions require that the chains and sprockets not only handle gritty and abrasive materials, but come in actual contact with them. All styles and sizes of chains shown in this Bulletin are carried in stock for immediate delivery, while others will be added as fast as facilities permit. Copies may be obtained from the company's office, Power Bldg., Craig street, Montreal.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

FOR SALE — ONE (1) PLAIN LANDIS Grinder, 10" x 30"; in good working condition. Price reasonable. Apply Canada Forge Co., Welland, Ont. (20)

FOUNDRY AND MACHINE SHOP WITH stove patterns and stock. Splendid opening. Apply Mrs. Thomas Johnston, Kemptville, Ont. (23)

FOR SALE—BERTRAM WAVING ATTACHment for eighteen pounder shells. First class order. Will sell cheap. Lymburner, Limited, Corner Berri and Commissioners, Montreal, Que. (22)

FOR SALE—STEEL WATER TOWER WITHout Tank, 94 feet high. Will support tank holding 13,000 gallons. Cost new $1,600. Will sell for $400, f.o.b. Shawinigan Falls, P.Q. Northern Aluminum Co., Limited. (21)

FOR SALE — ONE NEW FORD SMITH Grinder for Shrapnel. A short time ago we purchased five, find four will take care of our work. The National Manufacturing Co., Brockville, Ont.

1—2-SPINDLE SHAPER, WOOD TOP, JOHN Ballantyne, Preston, make. used two months. 1 Dynamo, 45 lights, Toronto and Hamilton Electric Co. make. Used five months. Good as new. Box 195, Jordon, Ont. (R.T.F.)

1—C.G.E. TYPE 10—20 H.P. INDUCTION Motor—60 cycles, 220 volts, 45 amps.—1200 R.P.M., complete with Auto Starter. Pulley on Motor 12" Diam. x 10" Face. Cummer-Dowswell, Ltd., Hamilton, Ont.

FOR SALE—2—16 x 2 POWER FEED TURrets; 1—16 x 1½ Turret with threading attachments; 1—16 x 2 Turret; 1—16 x 8 Engine Lathe; 1—12 x 8 Tool Lathe; 1 Speed Drill. Apply J. A. Harvey, 16 Pearl St. (21)

FOR SALE OR RENT—MACHINE SHOP AND foundry, with garage. Good machinery, good locality. Lots of cars and boats. Power and rent very cheap. Box 334, Carleton Place, Ont. (21)

FOR SALE ELECTRIC GENERATOR TO run 80 lamps, 110 volts, 300 r.p.m., including switchboard and indicator, in good condition. Richards-Wilcox Canadian Company, London, Ontario. (23)

FOR SALE—POND PLANER 26 X 26 X 7 ft. table, complete in all respects and as good as new, big bargain. Winnipeg Machinery Exchange, Sutherland and Gladstone Streets, Winnipeg, Man. (24)

FOR SALE EXCELLENT PLANT FOR THE manufacture of electric passenger and freight elevators, patterns, drawings, blueprints, special and ordinary machinery and parts. We are instructed to offer this entire plant at a fraction of the cost. If you are looking for a splendid manufacturing proposition, write for particulars of this one. Winnipeg Machinery Exchange, Sutherland and Gladstone Streets, Winnipeg, Man. (24)

FOR SALE

Fox Monitor Lathe, 18" x 5' 6", 9-hole turret, cross feed, hollow spindle, 5-step cone; good as new. Plating dynamo, 6 volts, 250 amp.; used only a short time.

PENDRITH MACHINERY COMPANY
970 Queen St. West, Toronto (15)

FOR SALE

TWO ENGINE LATHES FOR SALE—ONE a 18" x 10' McKechnie & Bertram; the other other a double-end pulley lathe 18" x 10' between face plates; both ends completely independent; very suitable for cutting off base and open ends of shells. Turnbull Elevator Mfg. Co., Toronto. (22)

FOR SALE—COMPLETE MACHINE SHOP, fully equipped and working, in good city: low rent, cheap power: plant includes five lathes, Universal milling machine, grinder, etc. Will entertain partnership with practical man who has cash to invest, or sell outright. Box 201, Canadian Machinery. (21)

FOR SALE—NEW HAVEN, 60-INCH SWING Standard Engine Lathe—triple geared. 15 ft. bed, hollow spindle, cuts threads 1 to 12. Compound rest, countershaft, steady rest, wrenches, etc. This tool is in excellent shape and owner offers special bargain. Particulars from Winnipeg Machinery Exchange, Sutherland and Gladstone Streets, Winnipeg, Man. (24)

FOR SALE — TWO GOLDIE-McCULLOCH Wheelock Engines—cylinders 16" diameter, 38" stroke; both engines now running, but will be replaced with Hydro-Electric. Engines guaranteed to be in perfect condition, and will be sold complete with belt wheels, one 14' x 35" face and one 12' diameter with 24" face, also belting if required. Canadian Consolidated Felt Co., Berlin, Canada. (19)

WANTED

WANTED BERTRAM WAVING ATTACHment for 4.5 Shells, with or without Lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson Limited. (R.T.F.)

ENGINEER WANTS AGENCIES FOR MONTreal and district. Side line or specialties, on commission basis. X.Y.Z., Canadian Machinery, Montreal. (19)

WANTED — BERTRAM WAVING ATTACHment for 4.5 shells, with or without lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson, Limited, Hamilton, Ont. (rtf)

BOILERS WANTED—TWO SECOND-HAND, about 150 H.P.; at least 80 pounds working pressure under Ontario Government Boiler Regulations. Give full particulars, Box 198, Canadian Machinery. (19)

REPAIRING

ALL KINDS OF MACHINERY REPAIRED, rebuilt and installed. W. H. Sumbling Machinery Co., 643 Yonge Street, Toronto, Ont.

WANTED

Burned out Tungsten Lamps, late type, drawn wire, 25, 40, 60 and 100 Watts, 110 and 115 volts.

DOMINION TUNGSTEN LAMP FACTORY
ST. CATHARINES, ONTARIO

SITUATIONS WANTED

LARGE SHELL MANUFACTURERS — MEchanical engineer with shop, designing and executive experience with prominent Canadian quantity producer of 9.2". At present employed. Best of references. Address, in confidence, Box 200, Canadian Machinery. (21)

PATENTS

THE PROPRIETOR OF LETTERS PATENT No. 126215, relating to "pump device," desires to dispose of the patent or to grant license to interested parties at reasonable terms, with a view to the adequate working of the patent in Canada. Inquiries to be addressed to the patentees, Aktiebolaget Ingeniorsfirma Fritz Egnell, Stockholm, Sweden. (21)

SITUATIONS VACANT

WANTED—FOREMAN TO TAKE CHARGE of Brass Foundry. Apply with full particulars. Box 203, Canadian Machinery. (21)

WANTED—YOUNG MAN TO HANDLE ADvertising of a line of engineering equipment. Must be prepared to locate in a city of 15,000 population. Salary to start, $70 per month Box 184, Canadian Machinery.

MECHANICAL SUPERINTENDENT WANTed—for plant of the Starr Manufacturing Co., Limited, Dartmouth, Nova Scotia (near Halifax), operating one 10-inch and one 18-inch train of rolls, producing merchant bar iron. Manufacturers of ice skates and bolts and nuts. Address the company direct, stating age, experience, salary required, giving references, also when services will be available. The Starr Manufacturing Co., Limited, Dartmouth, N.S. (22)

IF what you want isn't advertised in this issue, consult our Buyers' Directory, Page 73.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, JUNE 15, 1916 No. 24

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 22 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Hueatis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234. Mr. R. G. Langrill, 3112 Euclid Ave., Cleveland, Ohio, Tel. Prospect 1026R.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $2 a year; United States, $2.50 a year; other countries, $3 a year; Single Copies, 10 cents. Invariably in advance.

INDEX TO ADVERTISERS

Producing 4.5 in. Shell Billets in Electric Furnace

Staff Article

In the production of munitions an impetus has been given the establishment of the electric furnace in metal-working industries that under normal conditions would probably have taken some years to realize. The installation described refers to one only of a number of Canadian plants similarly equipped, and serves to indicate a development in steel-making that is to-day making rapid strides in Great Britain, Europe and the United States.

TO augment the production of steel billets for the larger shell forgings, electric furnaces are now being extensively employed, and, where properly operated, the results compare very favorably with those obtained by the open-hearth process. The successful manufacture of steel ingots or castings by the electric furnace method is now assured, the quantity output being governed entirely by the capacity of the furnaces installed and their power consumption, and the quality of product by the skill and experience of the operators. To convey to the reader some conception of the various details entering into the production of 4.5 in. shell billets is the purpose of the accompanying article.

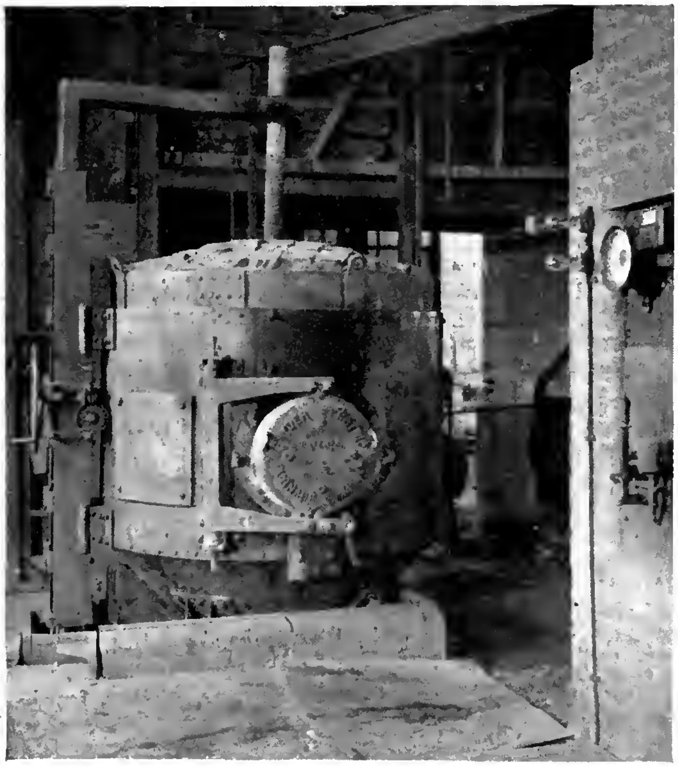


FIG. 1. SNYDER ELECTRIC FURNACE INSTALLATION.

Charging the Furnace

As soon as the melted charge has been poured into the ladle, the furnace is tilted back to its vertical position, and the operation of recharging is immediately proceeded with so as to avoid any unnecessary loss of heat.

The first detail is to insert a new contact piece in the bottom of the furnace. This is done by means of a long pair of tongs, the workman's head being encased in a special hood fitted with a thick colored glass, to protect his face and eyes from the intense heat and dazzling light of the fire chamber. When this lower contact is in place the upper electrode is lowered to test the arc. The furnace is now ready for recharging, and the proportions of material adopted in the particular plant here described, in order to obtain the grade of steel necessary to meet the shell specification, are as follows:—60 per cent. shell ends; 10 per cent. wrought iron and steel turnings; 10 per cent. baling wire scrap; and 20 per cent. sheet steel scrap in bundles.

The shell ends and turnings are first thrown in and reduced to a molten state; during which process it is necessary for an operator to be continually at the electrode adjusting wheel, shown at extreme left of Fig. 1. The brilliancy of the two lights on the wall, to the right, indicate to the operator the action of the arc within the furnace, and the wattmeter on the wall records the power being consumed. When the shell ends and turnings have been reduced to a molten mass, the wire scrap and baled sheet scrap are added.

The time required to melt a charge of approximately 2,800 lbs. (the capacity of the ladle), is from $2\frac{1}{2}$ to 3 hours, but in the case of a first charge, where the furnace has been allowed to cool down, 4 hours may elapse before the metal is ready to pour.

When the metal is about ready to be poured, the melter makes a test of the charge by drawing off a few pounds by means of a long handled ladle, inserted through the charging door. This is poured into a small cast iron mould about 5 inches long and $1\frac{1}{4}$ inches square. After it has set, it is cooled off and broken apart for examination as to fracture and carbon content. If the carbon be found to be below the requirement, sufficient material, rich in carbon, is added, following which, in due course another test is made. It, however, sel-

FIG. 2. TAPPING THE FURNACE INTO LADLE.

dom requires more than two tests to bring the mixture to within the limits of the specifications. When the experienced eye of the melter indicates that the charge is ready to pour, no time is lost in doing so.

Pouring and Filling the Moulds

When tapping the furnace the ladle is placed under the pouring spout, and by means of underground mechanism, the furnace is tilted upwards as shown in Fig. 2. This movement is so arranged that the pouring spout remains practically stationary, it being the approximate centre on which the furnace pivots, while being tilted.

As already stated, the charge averages about 2,800 lbs., this being the capacity of the large ladle. When the ladle has been filled, the surface is lightly covered with floor sand, to minimize heat loss through radiation, and also protect the workmen. As shown in Figs. 1 and 3, a monorail is located in front and above the furnace, by which the ladle is taken to a position above the revolving table, which carries the ingot moulds. To prevent any possibility of injury to the operators through splashing of metal, the various levers which control the ladle mechanism are fitted with long extensions. Once the pouring nozzle is brought into position it is seldom necessary to shift the ladle further, as the forty ingot moulds are so arranged that the revolving platform on which they are mounted brings them under the ladle in regular rotation. The table is easily revolved by one man, using a length of pipe placed on levers situated at eight points around the platform. The design of the table is shown in the line sketch Fig. 4.

Imbedded in the concrete foundation A, is the shaft B, which extends up to

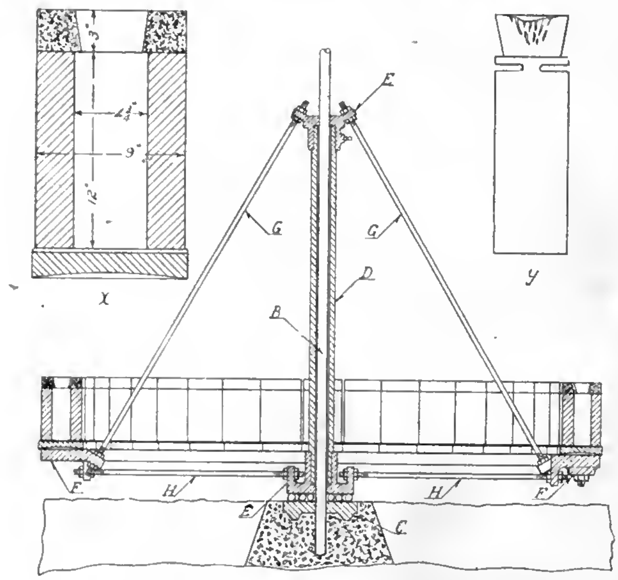


FIG. 4. INGOT MOLD, BILLET AND REVOLVING TABLE ARRANGEMENT.

the ceiling and is secured to one of the joists. About this shaft and resting on the foundation is the heavy thrust plate C, upon which the entire apparatus with the moulds, revolves. The framework consists of the centre column D, upon which is secured the two flanges E, the eight-piece platform F, being supported by means of the eight oblique stays G and the horizontal stays H; the whole revolving on the balls shown. An enlarged sketch of the mold and billet is shown at (x) and (y). It is usually found that the last billet poured, or possibly the last two, will not pass inspection, owing to "pipes" being formed by slag or chilled metal, etc.

Refitting the Ladle

When the last of the metal has been run out of the ladle, the latter is placed on the floor in a horizontal position and the stopper rod dismantled. It is allowed to cool, after which a new nozzle is placed in the bottom and a new graphite stopper on the rod. If necessary, new graphite sleeves are also inserted, but as these are not subjected to the running action of the molten metal they are generally good for a number of heats.

For about an hour before each cast, the interior of the ladle is kept hot by the flame of a strong fuel oil burner. This, of course, is usual practice, and is necessary, to avoid chilling the molten metal, when drawn from the furnace.

Preparing the Moulds

After the billets have solidified, which generally takes about ten minutes, the moulds are taken from the table and the billets removed. The metal shrinkage is usually sufficient to allow the billet to drop out freely, but in any case a light blow with a "sledge" ejects it. The ingot moulds are of grey iron bored and faced to the dimensions shown at x, Fig. 4; and have a life of from 80 to 100 casts, although often beyond this. The base plate is of grey iron, faced on the upper surface, and, to insure a good joint, a disc of felt paper 1/4 inch thick is placed between the mould and the base plate. Before the next charge is ready to be tapped, the moulds are again assembled in position on the platform of the revolving table.

Inspecting and Cutting to Length

The billets from each heat are marked with a serial number, and are taken to a Hall cutting-off machine where the top is cut off, leaving a length of 10 1/4 inches. The specifications call for a section approximately 20 per cent. of the cross sectional area of the billet being left at the centre for fracture and carbon inspection. Some drillings are also taken from each heat for laboratory analysis.

FIG. 3. CASTING 4.5 SHELL BILLETS IN INGOT MOLDS.

WINTER LIGHTING ATTENTION IN SUMMER

AS a rule manufacturers are more interested in lighting during the winter months than during the summer, prin-

cipally due to the fact that the lighting conditions in their plants are then forcibly brought to their notice.

The manufacturers of lighting equipment have, however, been endeavoring for some time to impress upon superintendents and managers of plants that the time to make changes, revisions or repairs in the lighting equipment is during the summer months, and that this work should be started early. Just after the winter season the superintendent or plant manager has clearly in mind his experience with the lighting system during the short and dark days, and it is, therefore advisable for him to make plans for the revision of the system, which can be carried out during the months when artificial light is seldom needed.

We find as the years go by, that the lighting season, so-called, is not as clearly defined a period as it was a few years ago, and that there is considerable activity during the summer months for industrial lighting.

METALLIC MAGNESIUM

MAGNESIUM is one of the several metals which the present war has proved to be of great value. As with numerous other products, before the war, France, Great Britain and the United States were dependent on Germany for their supplies of this material. The price was steady at about $1.45 per lb., but rose from $2.50 shortly after the beginning of the war to as high as $7.50 per lb. The price now is about $5.50 per lb.

The chief uses of magnesium are:—Scavenging alloys for making denser, cleaner, stronger and more homogeneous alloys; illumination, as in military uses for shrapnel trailers, star bombs, flare lights, etc., and in photography for flash lights.

Uses of Magnesium

In aluminum castings 2 per cent. of magnesium cleans up the aluminum, almost doubling its tensile strength, quadrupling its resistance to shock or jar and reducing the cost of machining by more than 50 per cent. This is of great importance in connection with the construction of aeroplanes and dirigible motors, high-speed engines of every type, and in all machinery or structures where strength, with a minimum of weight, is required.

Metallic magnesium is usually recovered by the reduction of the chloride, but it can also be obtained from the reduction of the oxide or carbonate. The common magnesium carbonate rock is known as magnesite. Deposits of this material occur in a limited area in the township of Grenville, Quebec. The production in 1915 (including some calcined), amounted to 14,779 tons, valued at $126,535, in striking contrast with a yearly average production from 1908 to 1914 inclusive, of 621½ tons. While the known deposits are limited in area, there is every possibility that the district contains other workable deposits. Float magnesite has been found over a wide area. Magnesite is also found in Yukon and in the Cariboo district, British Columbia.

The highly refractory quality of magnesite and its ability to form a hard vitreous body when combined with magnesium chloride has led to its adoption for a number of purposes. The largest consumption is in the manufacture of magnesite firebrick, crucibles and in bedding steel furnaces. It is mixed with sand, sawdust, ground quartz, talc and other substances in the manufacture of tile, flooring, roofing, artificial marble, wainscoting, etc. Magnesium bisulphide is used in digesting and whitening wood pulp in paper mills.

PATTERNS FOR THE SMITHY

WHERE there is a fair amount of repetition work done in the smiths' shop, the practice of having patterns is altogether a desirable one, as with these errors of working can be avoided. Generally speaking, such patterns should be of the exact size and shape of the forging as it leaves the hands of the smith, and not that of the finished article after machining and fitting. The former gives what might be called a limit size to the workman, and will diminish the weight of the stock used. Indeed, provided a good smith is in charge of the shop, and there are proper facilities for storing and displaying the reserve of stock at the command of the workmen, the use of patterns will make possible the utilization of short ends without wasting time, because the eye can better gauge what is wanted from a pattern or model than from a rough drawing and a few figures, which show the principal dimensions only. To provide him with such patterns does not cast any reflections on the workman's skill any more than it does in the case of a moulder's pattern. As a matter of fact, very many moulders could make moulds in sand without patterns, but that would not be a profitable way of working, unless in a few well-defined cases.—Practical Engineer.

BY-PRODUCT COKING OF COAL

THE great development of by-product coking of coal in Germany has assured her an uninterrupted and adequate supply of modern explosives. The value of this development may be measured by the importance of munitions in deciding the outcome of the war.

In the past the whole world has been dependent upon Germany for dye-stuffs and other substances prepared from the derivatives of coal tar. Thus both in peace and war Germany possessed a great industrial advantage over other nations.

British plants are now being established to cope with the demand for picric acid and trinitro-toluene, while the United States is also profiting by the lesson learned from the war. Before the war there was but one company in the United States producing distillation products on a large scale, while the latest statistics show that over 8,000,000 tons of coal were carbonized in by-product ovens last year, yielding over 4,800,000 gallons of benzol and 1,300,000 gallons of toluol. The full annual capacity of the benzol recovery plants now in operation and in course of construction is estimated to exceed 20,000,000 gallons.

Although Canada has the third largest reserves of coal in the world, beehive coke ovens, wasting the by-products, are still used in some sections and not a single additional by-product oven has been installed since the war. The war should teach Canada the obvious lesson that, whether for war or peace, it is criminal folly to neglect the utmost utilization of those resources which are lying latent in her bounteous supplies of bituminous coal.

SHIPYARD AT VICTORIA, B.C.

THE immediate benefit which Victoria will derive by reason of the passage of the Shipping Bill, recently approved by the Provincial Legislature, has been demonstrated in the completion of negotiations between the Provincial Government and the Cameron & Genoa Mills Shipbuilders, for the lease by the latter of two acres of waterfrontage property on the west side of the inner harbor, just south of Point Ellice bridge, whereon will be erected a modern shipbuilding plant. Work on the building of two ships will commence at once. Two ships will be laid down as soon as the facilities are ready and the company has assurance that it will receive contracts for two more. When the yard is in full operation it will give employment to 300 men, of which a large proportion will be skilled.

The company anticipates that fifteen wooden vessels will be constructed within the term of the lease of the shipbuilding site from the Provincial Government on Songhees Reserve. The type of vessel to be constructed will be a standardized carrier of a capacity of 1,500,000 feet of lumber and will cost, with machinery, approximately $170,000.

The Canadian Fairbanks-Morse Co., have been awarded a contract for a 75 h.p. gasoline motor and a "Goulds" centrifugal pump by the town of Orillia, Ont.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

MACHINE TOOL EVOLUTION

By A. L. Haas

SPECULATION on the subject of the ancestry, direct parentage, the prior and eventual evolution of the machine tool possesses more than mere interest or antiquarian curiosity. With the question is bound up the entire past of the mechanical industries, the present practice and the future progress of the world, that is as far as lies along mechanical lines.

Every industry is economically dependent upon the machine tool; practically every article of consumption owes a considerable although perhaps indirect debt to the series of machines so known and classified.

When Maudsley first conceived and applied the slide rest to the lathe he created a minor industrial revolution. From the slide rest has sprung all the allied machines which to-day comprise the equipment of the modern shop. Maudstey's slide rest forms the foundation, nay the underpinning of all the means of transport, taking only one field of engineering activity. The motor bus seems a strange descendant of the slide rest parentage, but rightly considered such is the ancestry of this popular and democratic means of transport.

The Lathe the Pioneer

The lathe, easily the king of the whole proletariat found in use to-day cutting and shaping metals, has experienced strange vicissitudes in its evolution. No doubt the very earliest form is that still in use in the Levant. Among the trophies brought home by the tourist to Egypt and the Near East are frequently screens and other articles of wood made up almost entirely of small turned pieces. The operator, whose limited kit, including his lathe, is carried about on his person, squats in a convenient corner and thrusts two pieces of wood having metal centres into the ground. A bow with loose string forms the motive power, the string being placed one turn round the work. A chisel held between the toes for rest, forms the cutting appliance. The bow is moved ceaselessly backwards and forwards with the left hand, while the right hand and the toes, which having never known footgear are very flexible, manipulate the chisel. The device is possibly as old as the potters' wheel, which is still in use at the present day in a form similar to that of classic Greece. While the only change in the potter's wheel is to make the entablature of metal, and drive it by power, its ancestor, as in the case of the modern lathe, could not possibly be expected to recognize its descendant. The engine lathe of only 50 years ago bears little resemblance to its direct outcome, the 4-spindle automatic, and the question becomes pertinent if we have yet reached the ultimate outcome in complexity.

Cast Teeth Obsolete

It is only yesterday, so to speak, that toothe wheels were the product of expensive patterns, and the inaccuracy of the foundry was corrected by means of a file when assembled, when 1-10 depth of tooth was a minimum of clearance to allow for irregularities. It led to the long tooth form now discarded. In the case of large drives, in view of the unearthly racket made by metal teeth, hornbeam teeth fashioned by the patternmaker and millwright were the only solution.

To-day the cheapest lathe on the market has quiet running true form teeth, cut from the solid blank. All things considered, they are actually cheaper than the foundry made article. It is probable, so universal have machined teeth become with their minimum clearance and quiet running, that few foundries ever get the job of casting toothed wheels. Damp sand and molten metal are scarcely ideal materials for an accurate product.

The gear cutter in its first inception was a hybrid with the milling machine for one parent. Subsequent to the introduction of the slide rest on the engine lathe and all it involved, the milling cutter and its possibilities marks the beginning of the second epoch in the machine shop. Yet even so the planer and shaper have not been displaced and for accurate work seem likely to survive.

To take another instance, the planer, engine lathe and column drill seem the likeliest ancestors for the boring mill. It has always been a debatable point whether great occasions produced great men or whether the contrary was in fact the case. Both sides of the argument have their partisans, and the truth may lie somewhere between the two extremes. Such is its usual habit. In like manner whether demand creates supply, or supply demand, forms a similar debatable point. In the question of machine shop evolution, it would be worth study as to whether the advances made were in response to necessity or forestalled it. Certain it is that many of the everyday products would have been simply impossible to produce had the machine shop lagged in the rear.

Action and reaction take place between tool and product. The speed change on the modern lathe and on the motor car bear a striking resemblance. In this case it may be assumed that the necessity of the car led to its adoption on the machine tool. At least machine tool makers were not slow in following the lead given if the assumption made is correct.

High Speed Steel

The greatest impetus of all of recent date is that given by high speed steel. There was always the precedent of the burglar and the safe. Sometimes the safemaker had the burglar fixed. An enterprising thief came along and safes had to be re-designed to suit new conditions of attack. The same rivalry holds good in the duel between the armor plate and the gun. In the case of high speed steel so novel were the conditions created that re-design became universal . Many makers in a vain effort to be up-to-date wasted tons of pig iron simply increasing weight without due regard to effect.

One curious point calls for notice. In the personal observation of the writer, many old type English tools when tested and in many cases without any strengthening, were found fully capable of dealing with the higher speeds and feeds of the newer steels. In one structural yard a battery of quite antique drills are running to-day at speeds and feeds which would have been considered miraculous by their designer, and are giving first rate results. The clumsiness and abnormal weight often criticised in English designs had a real and tangible value under the new conditions created by the modern steel.

Few structural yards or boiler shops, decently equipped, ever punch a hole now. It is cheaper to drill with corresponding advantages to the twist drill maker and the machine tool builder, and with considerable benefit to their product.

A case where demand certainly led supply is that of the steam turbine. Makers of machine tools were called upon to furnish machines of hitherto undreamt of size and abnormal weight even for their dimensions. The prob-

lem caused some troubles incident to both factors, while high speed steel added to the burden. One of the chief benefits afforded was in the ease of returning locomotive types, always a troublesome and very slow job. Grinding conferred a distinct benefit in realty obstinate cases, but the new steels made speeds possible only in the dreams of former superintendents. It would not be surprising to learn that the problem of low tyres spurred the metallurgist on in the provision of a capable tool steel.

The lathe may be considered as the ancestor of the column drill, in fact the type of back gear in some of the older type drills is of equal strength and similar to that in a lathe. It was undoubtedly the lathe which has influenced design more than any other single tool hence the honor due to Maudsley.

Using the language of the horticulturist, hybrids and sports are being evolved continuously, some for special purposes, others in the expectation they will be a permanent addition to the machine tool trade. All new machines have been so regarded at the beginning of their career. Who would have thought that the modern broaching machine would develop in the manner it is doing, for special work certainly, but as a regular purpose machine one might have been dubious not so long ago. As for grinding, battles were fought in the technical press over the matter, yet the grinder, cylindrical and surface, has not merely come to stay, but has created a distinctive place for itself, and relegated much of the former skill of the mechanic to the scrapheap.

Geometric Limits of Machine Work

As a general proposition, machine tool builders, or, if you will, the entire engineering trade, are interested so far as manipulation is concerned in the production of circular, helical, straight line and surface work. Other geometric forms seem foreign and are in the main distrusted and in nearly every instance are former-made, not generated. The influence of the earlier limitations of the craft are existent to-day: Circle, straight line, surface and screw, which last is after all but a coiled straight line. There is virtually no generation of a helical form from the straight line although this has been repeatedly performed. It is easier and more direct to copy. Yet a practically perfect helix may be generated from a straight line motion. An inclined straight line guidance with equal increments of motion should give a nearer approach to accuracy than 1-100 inch per foot lineal in lead screws.

It may not be out of place to point out that two wires of equal diameter coiled on a solid round has given a very exact form of thread for pitch when one is removed. This method of screw making was practised in the Far East when the Western nations were barbarians. Leonardo-da-Vinci, the medieval Italian painter, was an engineer of no small genius, and his records left in the form of sketch books prove that he foreshadowed many modern developments in the cutting and shaping of metals.

The lathe progressed from the bow to the pole for motive power, to the treadle, and thence to the power drive. It achieved a slide rest and a lead screw, put on changewheels and self-acting feed. From thence it developed backgear and geared feed box. Subsequently the fast headstock was in one form given a transverse motion. In another a drum with cams appeared below the bed and the automatic was out. Its power equipment is frequently now self-contained and a variable speed motor gives an even wider choice of feed and speed than its mere construction affords.

Future developments may set the armature of its motor in place of the back gear spindle, and movement of a switch grade in an infinite manner its range of speed. The electrical drive of the planer with the reversing motor and contacts shadows quite an electrical revolution as to power. A boring mill used for facing with a variable speed motor like the lathe may be controlled for feeds and speeds outside the operator's judgment by electrical contact, increasing speed as the tool approaches the centre and so give a uniform cutting speed.

The hand hammer universally 2 lbs. in weight has diminished to ½ lb. and is used now merely for marking off in many shops. For many purposes the file has been abolished as well as much smiths' work.

Modern welding has provided that standing joke of some years ago, a competent putting on tool. There will certainly come the time when the leather or other belt will be conspicuous by its absence and long lines of shafting be abolished.

A Possible Bearing Material

There seems no reason why cast iron having a hard even if rather brittle face should not be used for wearing surfaces. Chilling is one method, but the production of a carbide surface and grinding methods may ultimately give us an almost eternal wearing surface. Accuracy will then be, as in the case of slides, of durable maintenance.

In the consideration of future possibilities with regard to surface and slides, the question of surface grinding from the rough casting must not be lost sight of. Chilled rolls are being made by grinding from the rough and while the production of an approximately accurate surface of the highest character is still the function of the scraper, a surface of considerable accuracy may be produced utilizing modern grinding methods from very hard material. For example, it is not outside the present range of possibility to cast a lathe bed with almost dead hard surfaces; such a bed, finished by grinding would retain its accuracy over very long periods of time. The saddle which wears equally could if necessary be of ordinary material.

Scarcely any manufactured article has made such strides in recent years as the machine tool. To glance over catalogues only twenty years old is to be transported into another world altogether, a world where output received less consideration, and a less strenuous existence was in vogue..

Existing Tendencies

Two tendencies seem to exist, which are interdependent; an increase in complexity demanding greater skill and a return to simplicity on the score of capital cost. There is always the factor of the labor to be considered. Machine tools are being now built demanding increased skill, also others whose deliberate intention is to utilize skill of a less pronounced order. Complexity is by no means toward a demand for greater skill; it is in many instances introduced for the purpose of employing the simple operator dependent upon another for setting up and supervision.

Thus it is possible and seems a contradiction in terms, but is none the less a fact, that the least skilled labor demands the greater capital. In this wise caution is necessary. Skill consists in the production of good work by inferior means, want of skill demanding nearly perfect implements and machines almost automatic in their operation. The conflicting factors are many, the objects desired diverse, and it is by no means an inferior intelligence which can sum up the issues involved and decide between them.

Most progress consists in alternating periods of acceleration and retardation, the general direction being forward but in a series of waves. A new metallurgical discovery, a new adaptation, a fresh process and for the moment all previous practice seems to be in danger of the scrapheap, in actuality such a catastrophe is never imminent and most things survive but in a more limited sense.

The writer recently came across a Whitworth lathe dated 1840 No. 9, in quite good and usable condition, also in another locality a Muir shaper, no date, but from general design of the same period in good condition and at work.

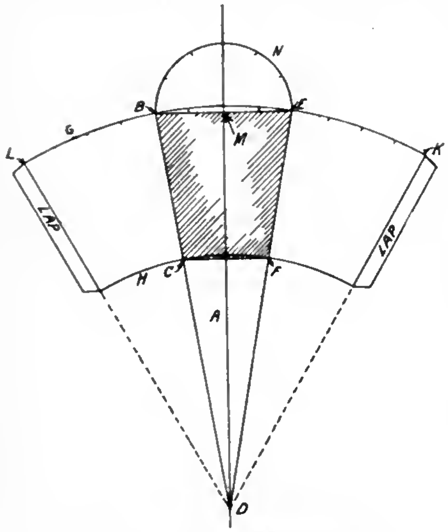
The interest in the ancient is pertinent to the matter of evolution, in the matter of machine tools, those of con-

siderable age are apt to provoke a smile since their design seems childish and elementary in form. Yet it is not sure we have any right to be moved to mirth, in their day they represented advanced practice as in turn the design of to-day will cause equal surprise to future generations. It is more a matter of wonder that they so closely resemble the tools of to-day. The modern express passenger engine is in essentials but not exact detail, on the plan of the "Rocket," and the lathes of 75 years ago in the same manner resemble the product of to-day.

A FOUNDRY LADLE STORY

By J. R. Tate

A SHORT time ago, I was traveling west, and being held up at a small town junction for a few hours, took a stroll around. Noticing the stack of a cupola, I naturally turned my course that way, so the side door being open, I walked up and stood looking into what seemed to be a blacksmith's shop. Two men were



DEVELOPING SHAPE OF SHEET FOR A FOUNDRY LADLE.

working there, one a blacksmith, and the other evidently a handy man. Taking me for a traveler, they paid little attention to me, outside of pointing to the further end of the shop, when I asked where the foundry was. Before going through, I noticed that the two men were working on a large new ladle and were also having trouble with it.

Offering Assistance

I walked on, and while standing at the foundry door, could hear the conversation of the men at the new ladle. It seemed that the foreman had gone away several days before, and had left instructions for this ladle to be made to certain measurements, and they were both about stuck on the job. The moulding shop did not interest me, so I decided to try and break in carefully on the two men. You know how it goes when a fellow comes into a foundry, all dressed and prettied up, he don't fit somehow, and I felt that I would be better fitted if my dollar shirt, etc., were replaced by my working clothes. However, sauntering back as though going out, I stopped beside the ladle over which the men were having a conference.

"Making a new ladle, boys?" I ventured. "Yes," answered the blacksmith rather shortly. "Rather a difficult thing to make too," I again ventured. "We're the ones as knows it," chirped in the helper.

"Do you know?" said I, "I helped a fellow once to make a ladle and I believe I remember how he did it, yes sir, I believe I do." Pulling out my watch, I said, as though they were old friends of mine, "I have just fifteen minutes to spare boys, now what do you say, if I just turn in and help you two fellows," at the same time reaching for a couple of cigars, which they very naturally connected up to.

"Well," said the blacksmith, "if you can tell us how to lay out a ladle that will measure up to these figures, we will certainly smoke to your health," and he started right in to smoke it, before I had a chance to make good.

Making Good on the Job

The size of the ladle required was as the sketch read 30 inches by 28 inches by 17 inches, being 30 inches deep. We figured out the correct shape as follows, incidentally we drew it out on the concrete floor of the shop. The first line was a straight one as marked A in sketch. We then drew a full-sized sketch of the ladle, required as indicated in shad- portion of cut, and placing a straight edge so that it would touch the points C and B. Next we drew a long line continuing it until it touched the former line A, as at D in cut, repeating the same method at E and F. From the point D all the other measurements were worked out. Taking a piece of string and getting the blacksmith to hold one end of it on point D, I took a piece of chalk and wound the string around it at a point which would permit the chalk to touch points B and E, then we had a large compass with which we struck a line as indicated at G, and shortening up the compass, we also struck line as at H, which line touched points C and F as in cut.

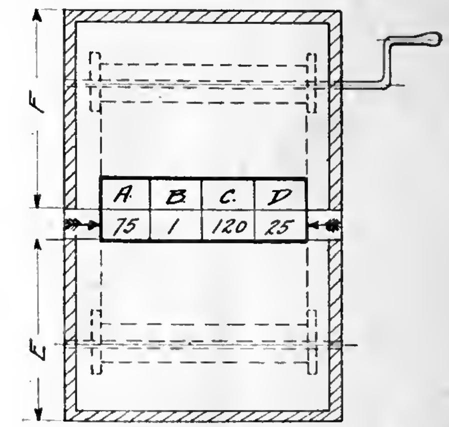
Having this much done, the next problem was to find out how long the strip of metal would have to be to form a ladle 28 inches in diameter at the upper end. Our method was as follows: taking point M as a centre we struck a line as marked N, this line really represents one-half of the upper end of the proposed ladle so, by taking a pair of dividers and stepping the half-circle off into equal parts, we had the distance it was around half of the top of the ladle. It was only necessary now to mark off the same number of spaces on each side of line A, as stepped off in cut, thus if there be six spaces to line N which represents half of the ladle, there will be twelve spaces in line G, which must reach all the way around the ladle. Having ascertained the length of the upper end of strip, a line was drawn from points K and L to the point D, after leaving enough for lap at each end of the strip.

We now had the exact shape to which the sheet must be cut, to form the ladle required. I have described the method in detail, that the laying out of any size ladle may be easily understood. First a cut of the ladle at top end of lineA, then from point D work out the rest, as we did. Your cut of ladle will always control the position of point D. Work out a small one in paper, it is good practice.

NOVEL MILLING MACHINE DIVIDING HEAD TABLE

By J. H. Moore

THE dividing head table shown in the accompanying illustration is designed to fill a much felt want by operators of milling machines. The writer feels sure that operators will agree with him on this point, as what is more confusing than the attempt to pick out a line of numbers



NOVEL MILLING MACHINE DIVIDING HEAD TABLE.

from a mass of same, such as are found on the usual type of dividing head tables. It takes considerable concentration of mind, and, even then, one is apt to make an error, especially after the list is well thumbed and soiled in use. The table shown can be made from any box of convenient size, and such as comes to the plant with large sizes of taps. The spools are quite an easy matter to get.

Little else is needed except that the box has a glass or mica front. The spaces (E) and (F) are painted black, while the remaining space is left transparent to show the numbers as they appear. Spaces A, B, C, and D are printed as follows:—(A) has number of teeth printed on space; (B) has number of turns to handle printed on space; (C) has gear on handle printed on space; (D) has gear on worm stud printed on space. By turning handle you can get any combination desired, and can see the complete line of numbers at once.

Safety Rules for Iron and Steel Manufacturing Plants

Selected

The State of Ohio has drawn up the accompanying Code of Rules and Regulations with a view to their adoption by the management of Blast Furnace, Coke Oven, Steel-making and Rolling Mill Plants, within that territory. From a study of the proposals, not a few of the suggested enactments may be worth while of appropriation by similar institutions in Canada.

THE Industrial Commission of Ohio has formulated a code of Safety Rules and Regulations governing the operation of blast furnaces and steel plants and has published them in pamphlet form. A similar code proposed by the same commission relates to foundries and to the employment of women in core rooms. These sets of rules, as prepared by sub-committees, have been approved by a general advisory committee, but have yet to be approved by the Industrial Commission. They are being sent to foundries and steel plants in Ohio and about two months' time will be allowed for the receipt of criticisms and suggestions from operating companies. The proposed regulations for blast furnaces and steel works are as follows:

By-Product Coke Ovens

1.—Hoppers should be guarded in such a manner as to prevent man from falling.

2.—Exposed moving parts of coal and coke handling machinery to be guarded as prescribed by general code. (It is recommended that grease cups be extended to the outside of the guards to facilitate oiling.)

3.—Some method of shutting off power to be installed near coal hoppers to enable workmen to shut down hopper shakers in case of accident.

4.—All approaches leading to rooms or buildings where coal dust or gas may accumulate to bear warning signs forbidding smoking or open lights.

5.—All elevated walks, stairways and platforms to be guarded by standard railing. (Note exception under Rule 6.) Would recommend that "standard railing" be specified as follows: To be not less than 3½ ft. in height, with intermediate rail midway between top rail and floor, and shall have toe-board or toe-plate at base at least 3 in. in height.

6.—Exception to Rule 5 to be made for platforms at both front and back of coke ovens.

7.—Quenching cars and larry cars to be equipped with automatic warning signals.

8.—All power transmission machinery to be guarded by standard guards.

9.—Reversing machines and counterweights on oven platforms should be enclosed by solid or mesh guards.

Blast Furnaces, Docks and Ore Storage Yards

Section A.—General:

1.—These rules are intended to cover the fundamental safety requirements for blast furnaces, cast houses, stoves, gas cleaning apparatus, skip hoists, pig casting machines, stock houses and stock handling machinery.

2.—Valves, switches and operating levers that control the movement of machinery covered by this code shall be provided with devices which will permit them to be locked.

3.—Standard platforms, provided with permanent stairways or iron ladders, shall be installed at all elevated points where employees daily or frequently are required to go. This rule shall not apply to railroad structures.

4.—Some means for the quick resuscitation of men overcome by gas shall be provided at the blast furnaces.

5.—A signal system shall be maintained between each blast furnace and its blowing engine room.

Section B.—Blast Furnaces:

1.—Each blast furnace shall be equipped with a telephone or speaking tube connecting the top of the furnace with the cast house or blower's office. It is also advisable to have a means of quick communication between the cast house or blower's office and skip hoist operator's house.

2.—A removable shield constructed with a hole for the movement of the drill shall be provided when tapping the iron hole.

3.—The mud gun shall be equipped with a funnel shaped guard at least 6 in. high around the receiving hole of the mud cylinder.

4.—For all new construction, explosion doors on top of the furnace shall be of the bleeder type only, and so constructed as to prevent, as far as possible, the escape of anything but gas and fine material.

5.—Platforms shall be provided for all bleeder valves, and wherever practicable such platforms shall be standard.

6.—Bustle pipes shall have a railed walk with toe-boards and shall be equipped with stationary stairs or steel ladders.

7.—Provision shall be made to protect persons underneath the skip car tracks from falling material.

Section C.—Stoves:

1.—Means shall be provided so that before men are permitted to enter stoves for any purpose, the cold blast and gas burner valves must be locked shut, the chimney valve locked in proper position and the operating mechanism to the hot blast valve disconnected or locked.

2.—All manholes at or about the top of each stove shall be provided with platforms accessible by stairways or permanent ladders.

Section D.—Cast Houses:

1.—Casting holes where ladles are loaded under the floors, shall be railed, or where this is not practicable, a grating shall be provided.

2.—Two or more exits from opposite sides or ends of cast houses shall be provided by runways or stairs. Where the cast house floor is elevated permanent or removable railings (not necessarily standard) shall be provided.

3.—All permanent gates in iron and cinder runners shall be operated from a distance.

4.—All men in cast house crews shall wear eye protectors. Men operating or walking about acetylene, electric or oxygen burning apparatus must wear colored eye protectors.

Section E.—Gas Cleaners:

1.—All gas cleaners which may have to be entered while the furnace is in operation shall be provided with one or more valves by which the entering gas can be shut off.

2.—Operating devices for dust catchers shall be arranged to enable the employees to dump them at such a distance and in such a location as to avoid the probability of being burned by hot dust.

Section F.—Stock Houses:

1.—Scale cars and transfer cars shall be equipped with fenders or wheel guards, and warning signals.

Section G.—Pig Casting Machines:

1.—Shields or shelter houses must be provided for protection of the men at the pouring end of pig casting machines.

2.—All men at pig casting machines shall wear eye protectors during the pouring.

Section H.—Relining Precautions:

1.—For relining purpose hooks on brick hoisting lines shall be designed so that in case of fouling, the hook will not be disengaged. The well through which material is hoisted to the working scaffold should be so constructed as to prevent the probability of the bucket fouling, and provided with a toe board around the opening of each platform.

Section I.—Ore Storage Yards:

1.—Any live conductor bar or trolley wires, not a part of a machine, and so situated as to be touched by a person on the ground or permanent passageway, should be protected as far as practicable.

2.—Track fenders or wheel guards shall be installed on all traveling ore handling machinery, except steam shovels, locomotive cranes, and other standard railroad equipment.

Section J.—Docks:

1.—Life preservers and pike poles shall be maintained in conspicuous and easily accessible places on all water front docks.

2.—Snubbing posts shall, as far as practicable, be of a type that will lessen the probability of the lines slipping off.

Bessemer Department of Steel Plants

These rules are intended to cover the fundamental safety requirements for Bessemer converters, hot metal mixers, cupolas, strippers and other equipment pertaining to the manufacture of Bessemer steel.

Section A.—General:

1.—Valves, switches and operating levers that control the movement of machinery covered by this code shall be provided with devices which will permit them to be locked.

2.—Standard platforms provided with permanent stairways or iron ladders shall be installed at all elevated points where employees daily or frequently are required to go. This rule does not apply to railroad structures.

3.—All men engaged in the pouring or handling of molten metal or molten slag shall wear eye protectors.

4.—Pouring platforms and other places where men are endangered from molten metal shall be provided with at least two exits.

Section B.—Hot Metal Mixers:

1.—All mixers shall be equipped with counter balances or an automatic mechanical device which will either return the mixer to an upright position or prevent it from upsetting in case the power is off the tipping mechanism.

2.—All mixers operated by hydraulic power shall be equipped with an emergency valve, so arranged that if the main operating valve fails while the mixer is pouring, the emergency valve can be operated immediately to prevent the mixer from upsetting or to return it to an upright position.

3.—A warning signal shall be installed on each mixer to be sounded when the mixer is about to be poured.

4.—Automatic rail stops shall be placed on either side of the opening of the hydraulic hoists used for conveying iron to mixers, and the opening in the floor caused by the raising of the hoist shall be guarded by automatic gates.

5.—Auxiliary hoists on ladle cranes shall be equipped with a type of hook which can be attached by the craneman to tip the ladle after the ladle has been hoisted to pouring position.

6.—There shall be a signal system between the mixer operator and the operator of the transfer ladle to notify the operator when the pouring is finished and the ladle is ready to be moved.

7.—All cages on hot metal cranes shall be arranged to give protection to the cranemen in case of spilling or dropping a ladle of hot metal. The methods recommended are either to provide escape platforms on the outside of the building, which will be accessible from the crane cage, or to provide an enclosed fireproof cage. Where an auxiliary enclosed fireproof cage is installed for emergency purposes, it should be equipped with an auxiliary control for the bridge travel to allow the craneman to move the crane away from the immediate place of danger.

Section C.—Cupolas:

1.—Cupolas shall be covered at charging floor level where men may be at work in same, to prevent chargers from throwing in material, or material falling from stack on to men. These covers are to be constructed so as to allow ventilation to men working in cupolas.

2.—Provision shall be made to cover openings between cupola shell and charging floor.

3.—Drop chutes shall be enclosed as nearly as practicable. Preferably props shall be pulled by snatch block and cable, rather than by hand. Warning shall be given before bottoms are dropped.

4.—When cupola cinder passes through hole in the floor, this hole shall be guarded by a suitable shield or railing.

Section D.—Ladles:

1.—All ladles shall be bottom heavy, and ladle cars shall be equipped with safety devices to prevent ladle tipping.

2.—Iron transfer ladles shall be provided with a warning signal.

Section E.—Vessels:

1.—A signal shall be provided to give warning whenever a vessel is to be turned up or down.

2.—A signal system operated from the scrap charging floor shall be installed to give warning when the vessel is about to be charged with scrap. Signal shall also be sounded when the charging of scrap is finished.

3.—The hydraulic mechanism operating the vessels shall be equipped with an emergency valve so arranged that if the main operating valve fails while the vessel is pouring, the emergency valve can be operated immediately to control the movement of the vessel.

4.—Vessels shall not be blown into stacks.

Section F.—Handling Molten Metal:

1.—Hydraulic pouring cranes shall be equipped with safety automatic devices that will hold the crane jib and ladle suspended in pouring position if the pressure should fail.

2.—The uncapping stand shall be equipped with a barrier to provide cooling of the ingots before they are uncapped.

3.—Ingot mold cars shall be equipped with coupling devices designed so that it will not be necessary under ordinary conditions for men to stand between the cars to couple.

Section G.—Bottom House:

1.—A mechanical means shall be provided for removing material from dry and wet mixers while they are in motion.

Open Hearth, Crucible and Electric Furnaces

1.—Tapping platforms, charging floors and other elevated points should be guarded by standard rails with the exception of pouring platforms.

2.—The opening in railing at tapping platforms for spouts or runners to be provided with a suitable removable guard to protect same when not in use.

3.—Charging machines must be provided with warning signals.

4.—When tearing out a furnace beneath the floor a tight boarding must be built around the furnace to prevent material from falling on workmen below. This should apply when a furnace is to be completely torn out and the uptakes and division walls removed, otherwise a floor in the uptake is sufficient.

5.—Provision shall be made such that when a furnace is down for repairs the gas can not be accidentally turned into the furnace.

6.—All cages on hot metal cranes shall be arranged to give protection to the cranemen in case of spilling or dropping a ladle of hot metal. The methods recommended are either to provide escape platforms on the outside of the building, which will be accessible from the crane cage, or to provide an enclosed fireproof cage. Where an auxiliary enclosed fireproof cage is installed for emergency purposes, it should be equipped with an auxiliary control for the bridge travel to allow the cranemen to move the crane away from the immediate place of danger.

7.—In new construction, charging buggies shall be equipped with coupling devices designed so that it will not be necessary under ordinary conditions for men to stand between the cars or pans to couple.

8.—Provision shall be made such that when a producer is shut off from a main pipe or when furnace is cut out, gas can not be accidentally turned on again.

9.—In crucible practice a safety cable or chain shall be provided at the edge of pouring platform to prevent men engaged in pouring from falling into ladle.

Blooming, Billet, Plate, Bar and Mechanically Operated Mills

1.—Subways or bridges shall be provided when passageways across tables, conveyors or other mill machinery are required.

2.—All gearing or dangerous shafting on roll tables shall be guarded.

3.—Coupling boxes, spindles and wabblers shall be guarded.

4.—Suitable means shall be provided for reaching the top of housings.

5.—Guards should be placed at the dead end of all roller tables to prevent material over-riding the end of the table.

6.—Scale tunnels shall be arranged so that scale can be removed without subjecting workmen to danger of falling hot scale, or if this is not practicable, men shall not go in pit when mill is in operation.

7.—Wherever practicable means shall be provided to protect men working about the rolls from flying scale and cinder.

8.—Power must be shut off pit covers while soaking pits are being repaired.

9.—The sides of bosh tank for quenching crane dogs shall be not less than 36 in. above the floor level.

10.—Counterweights must be guarded.

11.—Means shall be provided to warn the engineer of overspeeding reversing engines.

12.—It is recommended that straight running mill driving engines of 100 h.p. or over, be provided with a speed limit control and engine stop.

13.—Valve, switches and operating levers that control the movement of machinery covered by this code shall be provided with devices which will permit them to be locked.

14.—It is recommended that all platforms, runways, aisles, doors, stairways or ladders be kept as clean as possible.

Hand Operated Merchant and Rod Mills

1.—Spindles, coupling boxes, pinions and wabblers to be guarded.

2.—Danger from uneven or broken floor plates or gratings to be eliminated as far as possible.

3.—Subways or bridges shall be provided when passageways across hot beds, runways, spindles or tables are required.

4. Adjustable guards to be provided at outside of hot beds and skids to prevent material falling off.

5. Hot and cold saws shall be guarded, and means be taken to reduce the number of flying sparks.

6. On small mills where long bars are being rolled in more than one pass at a time, safety posts to be used where practicable, to protect roll hands from being caught in the loop.

Pipe Mills

Section A.—General:

1. These rules are intended to cover the fundamental safety requirements for lap weld mills, butt weld mills, coupling shop, galvanizing plants and all other equipment pertaining to the manufacture of pipe.

2. Standard platforms, provided with permanent stairways or iron ladders should be installed, where practicable, at all elevated points where employees are daily or frequently required to go. This rule does not apply to railroad structures.

3. All machinery, not otherwise mentioned and covered by this code, is to be safeguarded as specified for rolling mills or in general code.

4. Charging and discharging openings in welding and heating furnaces should be provided with shields to protect men from heat and flames.

5. There should be a signal system between the charging and drawing ends of all bending and welding furnaces.

7. Hot and cold saws shall be guarded, and means be taken to reduce the number of flying sparks.

8. Moving parts of threading and finishing machinery should be guarded as prescribed under general code.

9. A means should be provided to notify operators around the furnace when gas is to be reversed.

Section B.—Gas Producers:

1. All openings level with the ground, used for burning out gas flues, should be protected by railings or gratings when flues are being burned out.

2. When men are engaged in repairing gas producers or gas flues, when other producers in the same battery are in operation, suitable gates or valves shall be provided, by which all gas can be shut off.

Section C.—Lap Weld Mills:

1. Solid welding balls should not be used, as holes for the passage of gas should be provided.

2. Forced ventilation should be provided for the men working in intense heat.

3. Space between ends of troughs, conveyors, or tables and roll stands should be barred to prevent passage.

Section D.—Butt Weld Mills:

1. Movable draw benches and chains should be so constructed or guarded as to protect men's feet.

2. Stops or guards should be provided at the delivery end of cross roll troughs.

Section E.—Galvanizing Plants:

1. Where practicable, all tanks shall be protected.

2. Special attention shall be given to the ventilation of galvanizing plants to remove as much of the fumes and steam as possible.

3. Galvanizing kettles shall be railed or shielded.

Section F.—Coupling Shop:

1. Shields should be provided at welding hammers and rolls to reduce the number of flying sparks.

2. All coupling shop machinery should have the moving parts guarded as prescribed under General Code.

Section G.—Job Shop:

1. All machinery used for special work in job shops should have the moving parts guarded as prescribed in the general code.

Wire Mills

These rules are intended to cover the fundamental safety requirements for the wire drawing, rolling and fabricating departments of wire mills.

1. Standard platforms, provided with permanent stairways or iron ladders, should be installed, where practicable, at all elevated points where employees daily or frequently are required to go.

2. It is recommended that all platforms, runways, aisles, doors, stairways, ladders, fire escapes, or fire apparatus be kept as clean as possible.

3. Where practicable, all tanks or tubs should be protected.

4. Wire drawing, rolling and fabricating machines shall be equipped with means, conveniently located for quickly shutting down the machinery in case of emergency.

5. Screens or railings should be provided to protect open pot annealing furnace while being repaired or not in use.

6. Passageways under hot wires from annealing furnaces shall be protected.

Sheet and Tin Mills, Tinning and Galvanizing

1. Shearmen, openers, loaders and machine feeders should be required to wear gloves or hand leathers, and proper protection to the forearm.

2. It is recommended that all tools, furnished either by the employer or the workmen should be kept in a condition of good repair and it is the workmen's duty to report all unsafe tools or equipment to his employer.

3. It is recommended employees should take proper precaution to prevent cold or wet objects coming in contact with molten metal.

4. Workmen shall wear eye protectors when grinding, chipping and atteading galvanizing pots and tinning pots, unless other protection is provided.

5. Standard railings shall be provided around flywheels and drives. Cross-overs or bridges with hand rails should be provided when passage from one side of the mill to the other is necessary.

6. Wabblers on the end of the roll train shall be guarded, also the entering side of mill couplings when more than one roll is driven.

7. Shields shall be placed over furnaces doors to protect workmen from heat.

Puddling Mills, Busheling or Scrap Furnaces

It is recommended that the following shop rules be adopted:

1. When furnaces are to be fired, the dampers must always be pulled up before the blast is turned on.

2. Before charging a furnace, the cinder on the bottom of the furnace shall be permitted to cool off until it is non-fluid.

3. All obstructions must be cleared off the standing before charging a furnace.

4. When tools are taken from the bosh, they must be dried off before placing in hot metal.

5. When throwing scale into the heats of hot metal, care must be taken to see that the damper of the furnace is pulled up its full height.

6. After a heat of iron has been drawn from the furnace, the damper must be pulled up or adjusted to full draft before cooling off or fixing the furnace.

7. When throwing water into a furnace to cool off the cinder, it should be used in small quantities and extreme care taken to see that there is no bosh cinder or other solid bodies in it. At no time is any wet or damp material to be thrown into a furnace when there is melted cinder on the bottom of the furnace, when the damper is down, or the draft is shut off.

8. The throwing of water on balls of iron when taking out of furnaces to the hammer or squeezer is strictly forbidden.

9. No water shall be allowed to accumulate on the standings of furnaces, or along the mill races that the hot iron is run over to the squeezer or hammer.

10. In putting iron in the squeezer, great care must be exercised not to put the basket or tongs between the drum of the squeezer and the ball. In the event that tongs or baskets are caught the workmen must let go of same at once.

11. Furnaces are not to be fired without slacking the blast sufficiently to keep flames from the fire chamber burning the men working about the furnace.

12. Hot taps must not be placed near water.

13. When dumping tap buggies, care must be exercised to not allow cinder to come into contact with damp or wet ground.

14. Water must not be thrown on hot taps.

General

1. All bloom boys and roll hands must wear goggles or copper wire face masks.

2. All dampers and doors on furnaces must be properly balanced and balance weight must be adjusted by the workmen and securely fastened each time.

3. Where switches are in use on a telepherage system sufficient light must be provided by which to change switch.

4. When ash pits are two or more feet deep, safe and substantial means of access to and egress from pits shall be provided.

5. Muck mills shall be protected in accordance with rules pertaining to hand-operated rolling mills.

BLACKING AND WAXING SMALL CASTINGS

FOR a good many purposes it is neither necessary nor desirable to paint iron castings. In such cases blacking and waxing usually fills the bill, and being very simple can be carried out anywhere. After being cleaned off and dressed up, the castings are blacked and polished with some good stove polish, or fine black lead wetted down with turpentine, and after being polished are made hot and thinly coated with beeswax or other tough form of wax. When cold they are again brushed up. As a general thing they will then resist rust in all ordinary indoor positions. The wax appears to attach itself very firmly to the hot metal and prevent air and moisture reaching the surface, while a very small quantity need be used. Hard waxes such as carnauba wax, and paraffin, do not seem to be so effective as beeswax, and can therefore be left alone in regard to this kind of work.

CASTING METALS IN IRON MOULDS

By W. J. May.

UNDER suitable conditions and with certain forms of castings, all metals can be cast in iron moulds of some amount of thickness, but, owing to the cost of the moulds, this can only be done economically where very large numbers of precisely similar castings have to be made. Up to the present time no very great progress has, consequently, been made, "die-casting," as it is called, having been restricted to the casting of soft metals by a few firms who have had courage enough to break away from the old-fashioned methods of doing foundry work. In the result, however, they appear to have had a fair amount of success. That there is a demand for this class of work is becoming apparent.

Of course, casting in metal moulds is not a new process, as type has been always cast in such moulds, and tube and strip ingot for drawing and rolling is cast in iron moulds. It is simply the extension of a somewhat old process to a wider field of operation that has to be arranged for amongst mechanics not trained for the work. In the near future, however, it is practically certain that there will be greater standardization of work and in such things as permit of it, increased cheapness of production will be sought, even where this increases the wages of the individual worker. Really, it does not matter what a man earns so long as he reduces the cost of the articles he produces. Permanent mould casting and machine forging in dies will have, very largely, to take the place of handwork, and the sooner this is recognized the better for all concerned, as both mean considerable reductions in the cost of production.

Metal Moulds and Sand Moulds

In dealing with metal moulds a great many people seem to think that they have the same conditions as with sand or loam moulds; but in this they are working on wrong lines. In sand or loam moulds, gases and air pass into and through the mould itself, and in this way the exact state of the metal poured is not so stringently important, because up to a certain point there is a fairly free escape for all gaseous matters formed or contained in the moulds and metal. With the metal mould there is no escape for any gas unless vents are provided. In the case of dirty metals likely to throw off gases this is a serious matter, because if the escape vents are insufficient or wrongly placed the gases become occluded and porous castings result. It, therefore, becomes necessary to design moulds to prevent such troubles.

Every case must be dealt with according to local conditions, however, and no strictly hard-and-fast lines can be laid down. So far as the metals and alloys are concerned, they must be clean and free from oxides or other gas-forming matters, and they must be fluid. As a rule, freshly melted metal is necessary, and in addition it should be melted quickly. In many cases some deoxidant flux will be required, and this must be an effective one.

On the economic side of the question, permanent moulds have to be kept busily at work during the time they are in use, and to get good results it is necessary that a number of moulds and a sufficiency of crucibles to keep them going should be employed. It is of no use to pour on chance occasions for one or two castings, as this is certain to prove a failure, and generally it is useless to work for less than full days, and then only with a group of men and boys selected for the job. To obtain economy in working, a regular routine must be followed for fairly long periods. As a rule, iron moulds do not work well at first, as some change takes place in the machined surfaces for some time. For this reason part of the first lot of castings are practically certain to be useless, although eventually, with careful working, very few wasters are produced.—Practical Engineer.

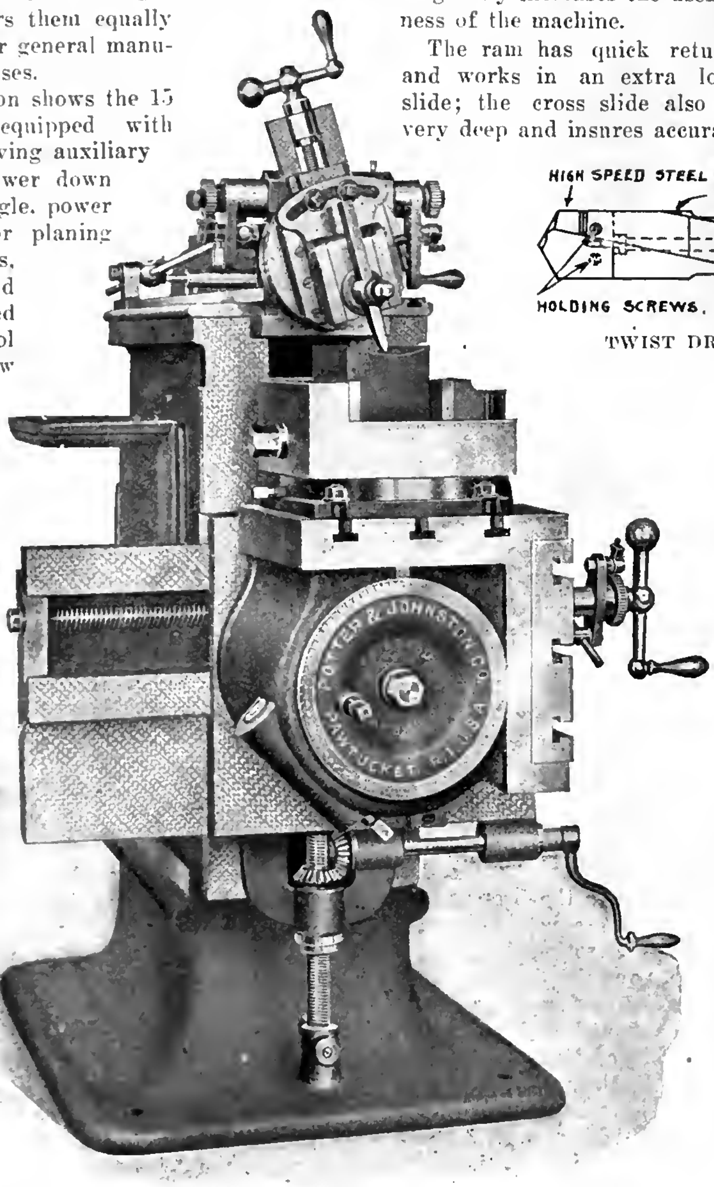
PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

UNIVERSAL SHAPING MACHINE

SIMPLICITY of design, convenience of operation, and extreme care in manufacture characterize the Universal Shaping Machines which are built by Potter & Johnston Machine Co., Pawtucket, R.I. These machines are made in 15 in. stroke and 24 in. stroke sizes, and, while primarily intended for the finest grades of die work and tool making, the substantial nature of their construction renders them equally well adapted for general manufacturing purposes.

The illustration shows the 15 in. machine equipped with swivel table, having auxiliary tilting side, power down feed on any angle, power rotary feed for planing internal curves, automatic feed stop, graduated collars on tool head feed screw and table feed screw, and swivel vise, with graduated base.



15-IN. UNIVERSAL SHAPING MACHINE.

The swivel table has tee slots on two of its sides, and revolves through an arc of 90 degrees to zero, and is accurately graduated in front so that pieces may be machined to any precise angle without tentative setting. The table is revolved by worm gearing, and can be fitted with an auxiliary tilting side for obtaining compound angles, a valuable feature in tool room work.

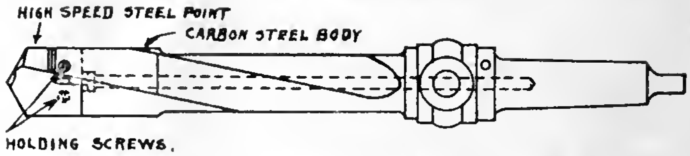
The down feed can be varied while the machine is in motion and is thrown out by a positive stop at any predetermined point. Power rotary feed to the head enables internal curves to be accurately formed and greatly increases the usefulness of the machine.

The ram has quick return, and works in an extra long slide; the cross slide also is very deep and insures accurate planing to the limit of the stroke. Hardened and ground steel faces are fitted to the vise jaws, one of which swivels for gripping irregular work, the construction of the jaws being such that the work is drawn down when gripped.

All belt-driven machines have a two-speed countershaft giving six changes of speed with a three-step cone, while motor-driven machines have a special base extension for electric motor. The net weights of the two sizes of machine are 2,500 lbs. and 4,400 lbs. respectively.

TWIST DRILL WITH RENEWABLE POINTS

THE extent to which the cost of high-speed steel is influencing the construction of small tools is illustrated by the use of this material for the cutting point only in large drills used in drilling high-explosive shell billets.



TWIST DRILL WITH RENEWABLE POINTS.

The accompanying illustration shows a type of twist drill constructed in this manner by Leadbeater & Scott, Sheffield, in which a good grade of carbon tool steel is used for the body and a cutting point of high-speed steel is detachably mounted on the end. A small pilot boss centralizes the drill point on the end of the body, the drive being taken by a tongue on the back of the point, fitting in a groove milled across the end of the body. The point is held in position by two hardened screws, which are free of any driving stresses.

The sketch shows a drill with central lubricating channel opening to each lip, and a body diameter reduced so as to minimize binding stresses in the hole and give free exit for chips.

ONE TON DELIVERY TRUCK

BY the conversion of a Ford car into a light and serviceable one-ton truck, the Fairbanks-Morse "Redden Truck-Maker," offers an ideal vehicle for quick and inexpensive delivery. This attachment is so constructed that it is adaptable to any type of Ford car, and can be attached in a few hours without any machine work or alteration of car construction.

The attachment makes use of the existing rear axle as a jack-shaft and adds a new axle and wheels. A lower gear ratio obtained by means of the driving sprockets enables the Ford motor to handle the load with as much ease as it does its passenger load, the increased gear ratio reducing the speed to a safe

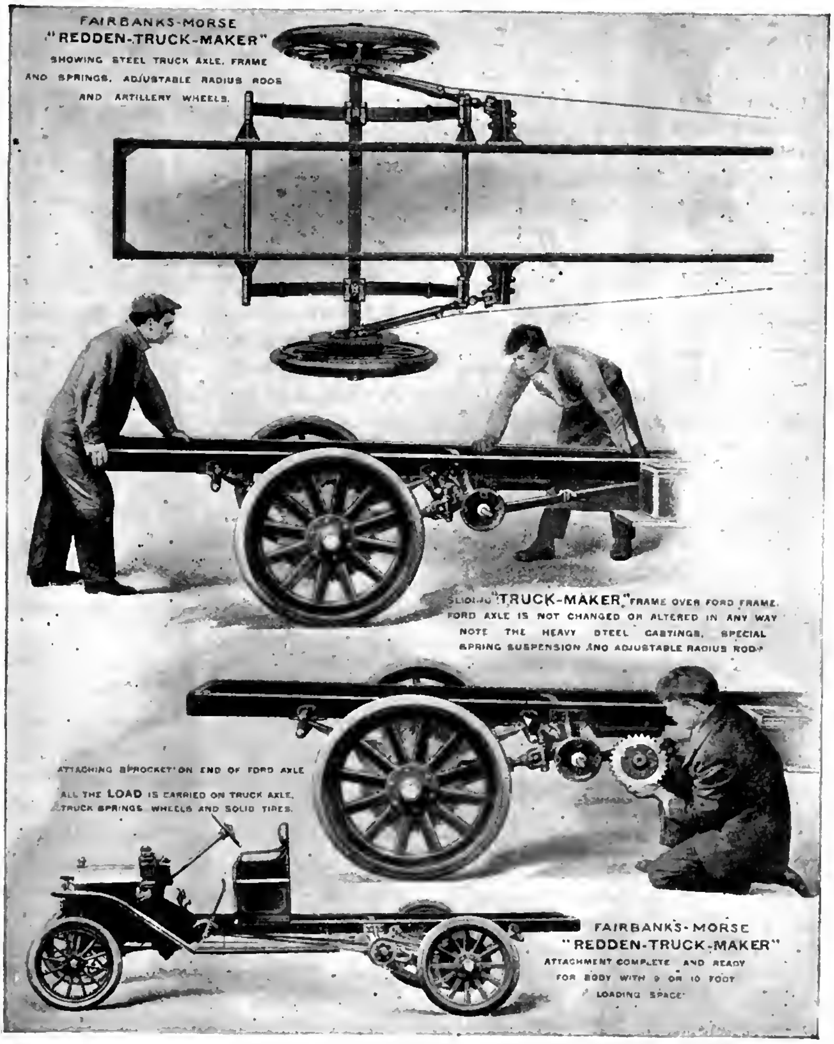
and conservative rate of 14 miles per hour.

The frame of the attachment is made of 4-inch channel-rolled steel, with a length (back of the driver's seat) of 8 feet 8 inches. The rear axle of the truck is secured to the frame by means of 40 inch. semi-elliptical springs. The rear axle thrust is taken by adjustable radius rods, the rear axle being so located that the load comes entirely upon the rear wheels and axle, thus relieving the forward portion of the car of any additional strain. The wheels are of heavy artillery type, S. A. E. standard 34 x 3, and supported on heavy duty roller bearings. The drive is transmitted through heavy roller type chains from a 20-tooth sprocket on the car rear axle to one of 40 teeth secured to the truck axle.

"REDDEN TRUCK MAKER"

Special cast steel brackets, bolted to the auxiliary, or truck frame support the car axle. The rear wheels are equipped with 12 in. expanding emergency brakes, fitted with fibre lined shoes.

When attached to a Ford chassis the wheel base is 132 inches with a tread of 64 inches, furnishing a loading space of from 45 to 50 square feet. The attachment has an approximate weight of 900 pounds, and through its simple construction combines strength and economy; in addition to ease of operation, minimum fuel consumption and repair expenditure.



SINGLE PURPOSE BAND TURNING MACHINE

A BAND-TURNING machine of highly specialized design is shown in the accompanying photographs, Figs. 1 and 2, which is built to handle shells from 3 in. to 6 in. in dia. The high degree of accuracy demanded in this work is insured by the integral construction of the machine, while capacity is likewise insured by the simplicity and ease of operation.

The work is held in a push collet chuck contained in the nose of the spindle, the main bearing being made sufficiently large to accommodate it as shown in Fig. 3. The base of the shell is supported by a conical cup bearing mounted on a hinged bracket which is swung out of the way when changing the work. This bracket is adjustable along the bed so as to allow a particular size of shell to be accurately located, the action of the push collet chuck being to press the shell outwards into the cup rest which thus automatically centres the base end and also acts as a locating stop for the shell length wise so that the band is in the correct position relative to the cutting tools.

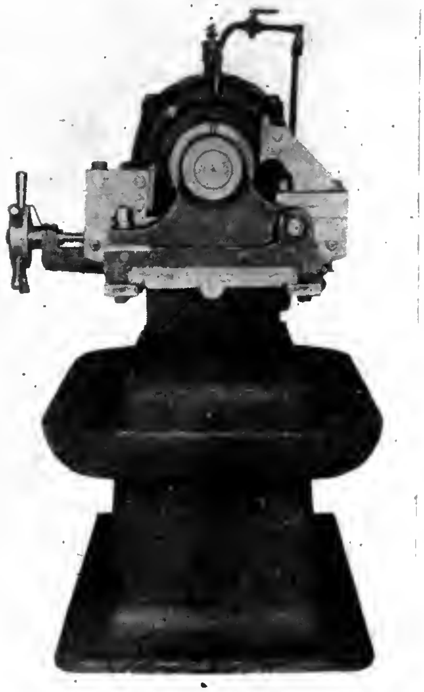


FIG. 1. END VIEW OF BAND TURNING MACHINE.

Two cutting tools are employed, each of which finishes half of the band pro-

file. They are fed in simultaneously, a large diameter micrometer dial being provided on the hub of the hand wheel. Ample power is obtained through a 15 in. by 6¼ in. pulley mounted on the spindle, while lubricating and coolant requirements are fully provided for.

FIG. 2. 6-IN. BAND TURNING MACHINE.

The machine illustrated is for handling 6 in. shells and has main spindle bearings 8½ in. x 7¼ in. front, and 5¼ in. x 4 in. rear, the total weight being 2,700 lbs. It is the product of the Roelofson Machine & Tool Co., Toronto.

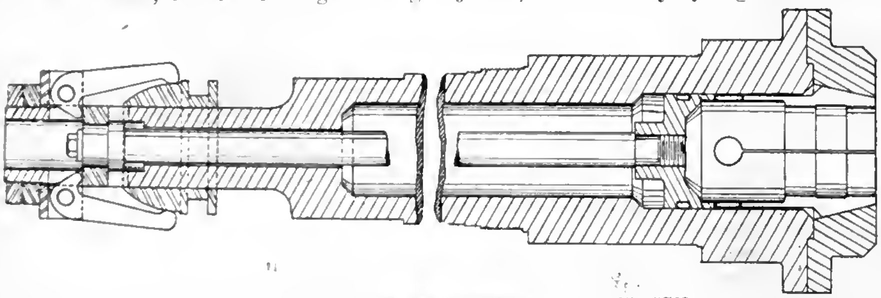
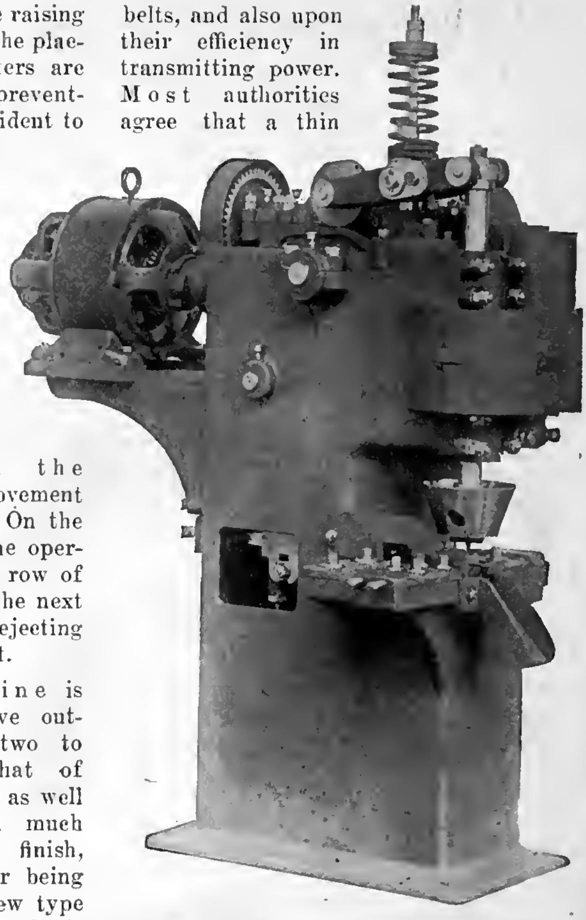


FIG. 3. DETAILS OF PUSH COLLET CHUCK.

SEMI-AUTOMATIC BURRING MACHINE

THE accompanying illustration shows a semi-automatic burring machine for removing the rough edges or burrs from all standard sizes of square and hexagon hot pressed nuts, manufactured by the National Machine Co. of Tiffin, Ohio. It is operated by a direct-connected, adjustable speed, direct current Westinghouse motor, having a two-to-one speed ratio with a maximum speed of 1,160 r.p.m. With this machine it is only necessary for the operator to place the nuts in the slot and push them forward. The raising and lowering of the spindle and the placing of the nuts under the cutters are handled automatically, thereby preventing all possibility of accident incident to feeding nuts otherwise under a rapidly revolving cutter. An injector automatically moves the nut to be burred under the cutting head and the operation is performed on the downward movement of the head. On the latter rising, the operator moves the row of nuts forward, the next incoming nut ejecting the finished nut.



SEMI-AUTOMATIC BURRING MACHINE.

This machine is claimed to give outputs of from two to four times that of hand machines, as well as securing a much more uniform finish, all of the burr being removed. A new type of burring head is used, which effectually cuts off all the fin when the cutters are gradually lowered by a cam feed. Safety reliefs are provided upon the vertical movement of the burring spindle and on the nut injector, and a safety spring takes care of any variation in nut thicknesses. The machine is readily changed over from one size of nut to another.

Wear and deterioration of belts may be caused in various ways. Frictional heat injures leather belts by burning the fibres, and this action is particularly rapid when the belts slip excessively. Belts hanging loose on revolving shafts, and even belts in operation, may be rapidly worn away by abrasion when the air of the shop contains gritty dust. Temperature, moisture, the tightness or looseness of the belts, and the general condition of the lacings and fastenings, all have an influence upon the life of the belts, and also upon their efficiency in transmitting power. Most authorities agree that a thin belt will hug a pulley better than a thick one, which is equivalent to arguing that belts should be used as thin as the service will permit.

MACHINABLE ACID-PROOF IRON

A CAST iron, claimed to be easily machinable and acid-proof and known as Corrosiron, is made by the Pacific Foundry Co., San Francisco. It is high in silicon and can be cast in difficult shapes. Many pieces have been made with bars of iron or steel cast within the metal, giving added strength. Because the alloy is inclined to be brittle it must be handled carefully. Its strength is reported to be half that of cast iron, a bar $1 \times 2 \times 24$ in. giving a transverse strength of 1,200 lb., with a deflection of about 0.14 to 0.18 in. The fracture is described as similar to that of ice, with long, flat crystals, but not granular. The shrinkage is 3-16 in. to the foot, about that of brass. Flat surfaces are avoided in designing, corners are rounded and the sections of metal are kept as even as possible. The greatest loss in some corrosion tests was 0.58 per cent. in 17 days' immersion in concentrated hydrochloric acid, while the smallest was 0.0015 per cent. in 7 days' immersion in various strengths of nitric acid.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER. J. M. WILSON. J. H. RODGERS.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. JUNE 15, 1916 No. 24

MACHINERY EXPORTS TO RUSSIA

TOWARDS the end of November, last year, the British Government took more or less drastic action relative to the importation of machinery of various kinds, and recently the Russian Government has become active along similar lines. The avowed idea in both cases is to minimize if not to wholly abolish all tendency to speculation in machine tool and kindred equipment imported to meet the needs of manufacturers. Before machinery can now be cleared for Russia, or at least before it will be allowed to land, full details of what constitutes the shipment must be placed on record with the Russian Government representatives, 44 Whitehall Street, New York City. Among other things, the name of the ultimate consignee must be given, and a deposit of fifty dollars be made to meet cost of cablegrams, etc., which may be necessary for the New York executive to transmit to and from Russia regarding the shipment under consideration.

Additional to the foregoing, and with a view to utilizing to the fullest possible extent the resources of the port of Archangel and other White Sea ports for the successful prosecution of the war, the Russian Government have decided to prohibit, except under special permission, the entry into those ports of all cargoes not destined for purposes of national defence. Manufacturers, merchants and others are accordingly invited to transmit to the secretary of the Commission Internationale de Ravitaillement, India House, Kingsway, London, W.C., particulars of all goods (including goods the export of which is not prohibited) which they desire to ship to Archangel during the coming season, giving same in the following order:—Nature of goods; quantity; approximate weight and measurements; names of consignors and consignees; approximate value; and month or months of shipment.

In the case of prohibited goods for the export of which sanction has been obtained, the following particulars should be given: 1—Number of the relative Commission Internationale de Ravitaillement permit, or, 2—Number of the War Trade Department license. It must be clearly understood that the supply of the above-mentioned particulars is in no sense a guarantee that shipment will be permitted. All envelopes should be marked "Archangel."

IS A STEEL MERGER IMMINENT?

RUMOR has it that a merger of the Dominion Steel Corporation, Nova Scotia Steel & Coal Co., Steel Co. of Canada, and Algoma Steel Corporation is on the tapis; and as is to be expected at this stage of the game—even granting some foundation for the scheme, nobody knows anything about it. However, in every instance, those likely to be directly in touch with such a project are disposed to be guardedly indifferent, if we might so put it, when approached.

As a result of munitions contracts filled and in process, all our big steel industries are to-day on easy street financially, and as regards plant equipment and expert administration are individually competent to maintain their position in a world competitive sense in the coming time. We are not therefore inclined to put much credence in the merger reports, although we would not be surprised to find Dominion Steel and "Scotia" develop the already initiated tendency to draw closer in the immediate future. The establishment of a shipbuilding plant by the latter, and the possession by the former of a plate mill of substantial capacity, although awaiting installation, lend color to the suggestion put forth. The new management of Dominion Steel has all the ear-marks of progressiveness and in the nature of things a rapprochment with "Scotia" has been therefore made possible. We expect, as above stated, to see a further development of this feature, and estimate that while the merger as per rumor may ultimately be realized, it will for some considerable time be kept in abeyance.

On the question of law, the merger consummation would undoubtedly usher in a hey-day period for the legal profession, as no matter how explicit it may be endeavored to construct and define a statute, and what is involved in the proposed merger would easily be no exception, a long and bitter fight for and against is sure to be staged. It is estimated that with the four concerns named, some 95 per cent. of our steel-making enterprise would be embraced, and it goes without saying that "a combination in restraint of trade," which is illegal in Canada, would then appear to exist. Even the United States Steel Corporation, which by the way won out in its fight against dissolution, does not hold within its scope more than 40 per cent. of American steel-making enterprise, hence, so far as the Canadian steel merger is concerned, the odds are much against it on account of its almost 100 per cent. comprehensiveness. The following clause of our criminal code is, we understand, applicable, or would be taken as being so:

"Every one is guilty of an indictable offence and liable to a penalty not exceeding four thousand dollars and not less than two hundred dollars, or to two years' imprisonment, or, if a corporation, is liable to a penalty not exceeding ten thousand dollars and not less than one thousand dollars, who conspires, combines, agrees or arranges with any other person, or with any railway, steamship, steamboat or transportation company—

(a) To unduly limit the facilities for transporting, producing, manufacturing, supplying, storing or dealing in any article or commodity which may be a subject of trade or commerce; or

(b) To restrain or injure trade or commerce in relation to any such article or commodity; or,

(c) To unduly prevent, limit or lessen the manufacture or production of any such article or commodity, or to unreasonably enhance the price thereof; or

(d) To unduly prevent or lessen competition in the production, manufacture, purchase, barter, sale, transportation or supply of any such article or commodity, or in the price of insurance upon person or property."

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh		$18 70
Lake Superior, charcoal, Chicago		19 75
Michigan Charcoal iron		28 00
Ferro nickel pig iron (Soo)		25 00
	Montreal	Toronto
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Hamilton, No. 1	$26 00	$24 00
Hamilton, No. 2	26 00	24 00
Victoria, No. 1	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base, Toronto	3.00
Steel bars, base, Toronto	3.25
Steel bars, 2 in. and larger, base	5.25
Iron bars, base, Montreal	3.00
Steel bars, base, Montreal	3.25
Twisted reinforcing bars, base	3.30
Bessemer rails, heavy, at mill	2.50
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	...
F.O.B., Toronto Warehouse.	**Cents**
Steel bars, base	3.10
Small shapes	3.75
F.O.B. Chicago Warehouse	**Cents**
Steel bars	3.10
Bars, 2 in. and up	4.00
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper, carload	$32 00	$31 50
Electrolytic copper	32 00	31 25
Castings, copper	31 00	31 00
Tin	48 00	50 00
Spelter	17 00	18 00
Lead	9 00	9 00
Antimony	33 00	35 00
Aluminum	65 00	64 00

Prices per 100 lbs.

BOILER PLATES

	Montreal	Toronto
Plates, 1/4 to 1/2	$4.25	$4 25
Heads	4 50	4 50
Tank plates, 3-16 in.	4 75	4 75

WROUGHT IRON PIPE

Prices in effect April 26, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 06	5 31
1/2 in.	3 91	6 08
3/4 in.	4 72	7 65
1 in.	6 97	11 31
1 1/4 in.	9 43	15 30
1 1/2 in.	11 28	18 29
2 in.	15 17	24 61
2 1/2 in.	23 99	38 90
3 in.	31 37	50 87
3 1/2 in.	37 72	61 18
4 in.	44 69	72 49

Lapweld

	Black	Galv.
2 in.	$17 02	$26 46
2 1/2 in.	25 16	40 07
3 in.	32 90	52 40
3 1/2 in.	39 56	63 02
4 in.	46 87	74 67
4 1/2 in.	57 15	90 81
5 in.	66 60	105 82
6 in.	86 40	137 28
7 in.	116 62	179 70
8 in. x 25 lbs. per ft.	122 50	188 75
8 in. x 25 lbs. per ft.	141 12	217 44
9 in.	169 05	260 48
10 in. x 32 lbs. per ft.	156 80	241 60
10 in. x 40 lbs. per ft.	201 88	311 06

List for Ontario, Quebec and Maritime Provinces

OLD MATERIAL

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 00	$17 00
Copper, crucible	20 50	20 50
Copper, heavy	20 75	21 75
Copper wire	20 75	21 75
No. 1 machine compos'n	15 75	15 75
No. 1 compos'n turnings	13 75	13 75
New brass clippings	15 00	14 75
No. 1 brass turnings	12 00	12 00
Heavy melting steel	9 00	9 50
Boiler plate	11 75	10 50
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	11 50	10 00
Stove plate	10 50	10 50
No. 1 machin'y cast iron	14 75	14 50
Heavy lead	5 50	6 00
Tea lead	5 50	6 00
Scrap zinc	11 00	11 50
Aluminum	36 00	35 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Coach and lag screws	50
Stove bolts	62 1/2
Plate washers	25
Machine bolts, 3/8 and less	40
Machine bolts, 7-16 and over	30
Blank bolts	30
Bolt ends	30
Machine screws, flat head, iron	06 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in.	$3.75 per lb. off
Nuts hex., over 1 in.	$2.00 per lb. off
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	37 1/2
Boiler rivets, base 3/4-in. and larger	$4.85
Structural rivets, as above	4.75
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS

	Per Cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	50
Finished Nuts over 1 in.	37 1/2
Semi-Fin. Nuts up to 1 in.	50
Semi-Fin. Nuts over 1 in.	37 1/2
Studs	45
Taper pins	.65
Coupling bolts	net
Planer head bolts, without fillet	.15
Planer head bolts, with fillet	net
Planer head bolt nuts up to 1 in.	.60
Planer head bolt nuts, over 1 in.	.55
Planer bolt washers	list plus 10
Hollow set screws	list plus .20
Collar screws	list plus .20
Thumb screws	.20
Thumb nuts	.75

BILLETS

	Per gross ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES

Standard steel wire nails, base	\$3 75	\$3 70
Cut nails	3 40	3 40
Miscellaneous wire nails	65%	
Pressed spikes, 5/8 diam., 100 lbs.	\$3 90	

MISCELLANEOUS

Solder, guaranteed	0.31
Solder, strictly	0.29
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	3.00
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medals, per lb.	0.20
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls., gal.	0.66
Linseed oil, raw, single bbls.	0.76
Linseed oil, boiled, single bbls.	0.79
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Packing, square headed	0.25
Packing, No. 1 Italian	0.30
Packing, No. 2, Italian	0.23
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per Cent.
Standard drills to 1½ in.	45
Standard drills over 1½ in.	5
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	net
Bit stock	55
Ratchet drills	net
Machine bits for wood	15
S.S. drills for wood	45
Wood boring brace drills	25
Electricians	20
Sockets	30
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks	list plus 5
Bridge reamers	55
Centre reamers	net
Chucking reamers	net
Hand reamers	5

High-speed drills up to 1½ in. and over 1½ in. Double list plus 20 per cent.

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60 per cent.; headers, 60; flanged unions, 55; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	\$4 15	\$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 50
Canada Plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 75	7 75
Fleur-de-Lis, 28 B.W.G.	7 35	7 35
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	7 00	7 00
Premier, 10¾ oz.	7 30	7 30

PROOF COIL CHAIN

¼ in.	\$9.45
5-16 in.	9.10
⅜ in.	8.35
7-16 in.	7.15
½ in.	6.95
9-16 in.	6.95
⅝ in.	6.80
¾ in.	6.70
⅞ in.	6.55
1 inch.	6.40

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B B

⅛ in.	\$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16 in.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	60-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	\$19 55	.....
1¼ in.	19 55	.....
1½ in.	19 55	12 70
1¾ in.	25 00	12 70
2 in.	25 00	14 00
2¼ in.	28 50	16 00
2½ in.	32 00	18 00
3 in.	40 00	21 00
3½ in.	45 00	25 00
4 in.	50 00	31 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	\$ 8.35
Galvanized, 24 wires, 1 in.	24.05
Black, 19 wires, ⅜ in.	6.90
Black, 19 wires, 1 in.	21.30

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	40%
Standard	40 & 10%
Cut leather lacing, No. 1	\$1.30
Leather in sides	1.10

TAPES

Chesterman Metallic, 50 ft.	\$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun. Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun. Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	\$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto

WASTE

WHITE	Cents per lb.
XXX Extra	.16
Peerless	.16
Grand	.15
Superior	.15
X L C R	.14
Atlas	.14
X Empire	.13
Ideal	.13
X press	.12
COLORED	
Lion	.10¼
Standard	.9¼
No. 1	.9¼
Popular	.8¼
Keen	.7¼

WOOL PACKING

Arrow, Axle, Anvil, Anchor .... Prices on application

WASHED WIPERS

Select White, Mixed colored, Dark Colored .... Prices on application

This list subject to trade discount for quantity

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	37 to .39
Tin	.58 to .60
Zinc	26 to .28

Prices Per Lb.

COPPER SHEETS

	Montreal	Toronto
Bars, ½ to 2 in.	$47 50	$47 50
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 in.	46 00	46 00
Copper sheet, tinned, 14 x 60, 14 oz.	55 00	55 00
Copper sheet, planished, 14 x 60 base	58 00	58 00
Braziers' in sheets, 6 x 4 base	47 50	47 50

BRASS

Brass rods, base ½ in. to 1 in. rd.	0.55
Brass sheets, 8 in wide 20 oz.	0.60
Brass tubing, seamless	0.55
Copper tubing, seamless	0.55

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American.	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

RUBBER BELTING

Standard	50%
Best grades	30%

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy	.35
Copper sulphate	.15-24
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, June 12, 1916.—The outlook for future trade conditions continues bright. Gradual increase is shown in the volume of business, both from the domestic and munition standpoint. The prospect of lower ocean freight rates is expected to encourage increased export business, in view of the contemplated move on the part of the British Admiralty of releasing a number of merchant vessels.

Pig Iron

The general situation is similar to that of the past few months, but a slight undertone of weakness is developing, and prices are expected to become easier. However, the activity in the producing field is as great as ever, with no easing up in requirements of the steel makers.

Steel

While the market is beginning to show a quieter tone, due largely to the general easing off during the summer months, the situation from a manufacturing standpoint shows little or no change. The scarcity of steel is still very noticeable, but premiums for early delivery are less frequent. Conditions in the plate trade are relatively unchanged, with the demand still very heavy. New demand for light black and galvanized sheets is quiet; but the demand for blue annealed and special sheets is still very great. The general market has been quiet, with very few price changes. Chicago price on iron bars is now 2.45c, being an advance of 1-10c per pound. Quotations on tin plate have advanced ½c, and are now 6c. Galvanized sheets are lower by 1-10c per pound.

Metals

Developments during the week have been very few; spelter being the only metal to show activity on an otherwise quiet market. Following a brief period of heavy buying early in the week, which showed signs of increasing in proportion, the market suddenly quieted down again to its previous conditions. Copper is quiet, and buying is light. Special developments are looked for in tin, owing to a number of conditions related to the present situation. Lead is dull and weakening. Antimony continues to show weakness with declining prices.

Copper.—The present market is quiet and transactions are comparatively light. The fact that many consumers are oversupplied has had the effect of bringing considerable resale metal upon the market. It is thought, however, that much of this copper will be withheld should the market become active. London reports a firm market under a comparatively light trade. Standard spot advanced £3 10s from £120; futures advanced £1 10s. from £118; and electro spot, with £2 advance, is quoted at £142. New York reports a quiet market, with prices weakening. Lake and electrolytic are ¼c lower, both being quoted at 28¼c per pound. Castings show a decline of ⅛c, present price being 26c nominal. No change is noted in local conditions.

Tin.—Owing to the recent dullness, quotations on future positions are relatively low, and dealers and producers await developments. Owing to the high prices prevailing in Great Britain, London reports a very quiet market, with quotations strong and advancing. The New York situation is still weak, and consumers show little interest in current developments. Quotations are easier, a decline of ½c placing the nominal figure at 44¾c per pound. Dealers here report unchanged conditions, with prices firm at 48c per pound.

Spelter.—Following the recent strength shown in spelter the market has again become quiet, quotations declining. It was generally anticipated that the firmer tone would stimulate buying, but no response occurred. Galvanizers are taking increased interest in the buying of spelter; while on the other hand, the brass mills are doing very little buying. Present London prices are £1 higher than those of a week ago. New York spelter is slightly stronger. An advance of ⅝c on the week placed present prices on a nominal basis of 14.05c per pound. In view of the continued dullness prevailing in spelter for some time previous to the recent activity, local dealers show a

further decline in their quotations. Current prices here are 17c per pound.

Lead.—The Trust price, after a decline of ½c, is quoted at 7c, with outside prices 6.95c, being a decline of about ⅜c per pound. Following the weakness on foreign markets, local dealers have declined ¼c on a very quiet market; present prices being 9c per pound.

Antimony.—In the face of an almost negative demand, the situation as regards antimony is very dull. New York quotations show a further decline of 2½c on foreign and American metal, the current price on both being nominal at 22½c per pound. Local dealers report a very quiet situation, with prices declining. This week's quotation of 33c represents a decline of 3c per pound.

Aluminum.—Conditions are unchanged, with prices somewhat stronger in the States. Dealers here, however, are declining on a steady market, quoting 65c, a drop of 3c per pound.

Machine Tools and Supplies

In spite of the fact that very few large orders are being placed for machine tool equipment, the trade is busy supplying requirements of manufacturers, both munition and domestic. Many large shell makers are still adding equipment, some of which are tools received on long placed orders. Delays in delivery are not so pronounced as a few months ago. Domestic requirements continue to be satisfactory. While the demand for supplies continues heavy, the situation is becoming less acute, owing to the easier prices prevailing. Quotations on finished material are gradually declining, and the cost of supplies is relatively effected.

Scrap

Little activity is shown in the scrap situation. Dealers report a quiet market, with prices declining. Consumers of heavy melting steel scrap are apparently well supplied for immediate needs. The general situation is comparatively quiet and prices are becoming easier. Machine shop turnings and also wrought iron scrap are plentiful. Changes this week all show a decline: machine compositions quoted at 15¾c, a decline of ¼c: under a similar decline new brass turnings are quoted at 15c per pound. Quotation of 5¾c on heavy and tea lead show a falling off of ¼c. Scrap zinc is 1c easier, being quoted at 11c.

Toronto, Ont., June 12.—The outstanding feature in the industrial situation is the indication that prices have advanced about as far as they are expected to go. This means that raw material will most probably not increase in cost to any appreciable extent. The scarcity of labour and shortage of raw materials may, however, affect the situation to some extent, causing a shortage of some lines and probably higher prices. The ocean freight situation is improving, rates having already declined owing to more tonnage being released. The situation in the steel trade is unchanged and the greatest activity prevails. The market is very firm and prices unchanged. The ingot metal markets continue weak and declines in prices of tin, lead, spelter and antimony have to be noted.

The decision arrived at by the Imperial Munitions Board to retain the original type of 8 in, and 9.2 in., shells and not adopt a new design will permit the manufacturers to proceed without delay with the preparation of their plants. The proposed shell forging was to have a closed base and open parallel mouth whereas the adopted design calls for a forging with a conical nose and open base. Large swing lathes will be required for making these shells and considerable equipment orders are looked for from forging plants and machine shops.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Steel

The market continues steady and firm with prices stationary. The upward movement appears to have about reached the top and any material advances are unlikely except in some steel products which are subject to special conditions. While prices may not advance much further there is little possibility of a decline and the present high level will no doubt obtain during the remainder of this year at least. The situation in the steel trade has not changed, the mills having all the business that they can take care of; orders on the books running well into 1917. Production, however, has increased considerably, and in addition, the new demand is not as heavy as it was, relative to the capacity of the mills to meet it. The latter are thus in a better position to take care of the increased demand than they were earlier in the year. While there are no price changes to note this week, quotations are very firm. Wrought iron pipe for instance is very firm and may advance on account of the scarcity of skelp, several makers of this material being sold up for the remainder of the year. Makers of boiler tubes are in the same position but as new buying is light a change in prices may not be made in the meantime. There is a big demand for wire rods and prices are very firm.

The decline in the price of spelter is improving the situation in galvanized sheets, but as it is no longer the sole factor in causing the present high price of sheets, a material decline in this material is not anticipated. Black sheets, acid and labour are all high, which will tend to keep up the price of galvanized sheets. Inquiry for black sheets continues lighter than it was several weeks ago. New orders are, however, generally in excess of the mill capacity. Sheet bar supplies are still below full requirements.

In the United States new buying is lighter but shipments by the mills against contracts are heavy and the demand on the mills by customers is still urgent. The steel market, however, is quiet, the usual summer dullness already being felt. Prices are firm and unchanged. The unfilled orders of the U. S. Steel Corporation about 9,937,798 tons, an increase of 108,247 tons over the previous month.

Scrap

The market is dull and prices have a weak tendency. Brass scrap, lead and zinc have declined but prices of other metals are practically unchanged from last week.

Machine Tools

Considerably greater activity is looked for in the machine tool business now that a decision has been arrived at with regard to the design of the 8 in. and 9.2 in. high explosive shells. Manufacturers who have been awarded contracts for these shells will now be able to go ahead with the preparation of their plants. A number of large swing lathes will be required and it is expected that orders will be placed shortly for all necessary equipment. As the design of the shells in the new contracts will be the same as in the original orders there will be less delay than would otherwise have been the case. Deliveries continue slow especially on standard tools.

Supplies

Business continues brisk but delay in obtaining supplies from manufacturers is causing dealers some inconvenience. This applies more particularly to iron and steel goods and is due to the shortage of raw materials. Linseed oil has again declined due to light demand, while turpentine is also lower for the same reason. French medal glue has advanced 2c, the market being very unsettled and quotations nominal when supplies are available.

Metals

A general weakness previous in the metal markets, copper being only metal to maintain any degree of strength. Tin, lead, spelter and antimony have all declined. The demand for practically all metals which enter into the manufacture of munitions has been steadily declining during the past two or three weeks. Prices have all been affected with the exception of copper which is unchanged. The situation in metals is engaging attention. Whether conditions are shaping for a general revival in both demand and price or for further depression is subject of considerable interest.

Copper.—The market is quiet and dull, with prices unchanged. New buying has been small and has been confined mostly to re-sales of metal by second hands. As the larger producers have sold up all of their production for some time ahead no weakness is likely to develop. Local quotations are unchanged and nominal at 30½c per pound.

Tin.—The market is dull and lower due to light demand. Consumers are showing little interest and are waiting until the market shows definite signs of turning. Indications point to a re-action towards higher prices. Tin has declined 1c and quotations are nominal at 50c per pound.

Spelter.—The market is quiet and lower following a decline in London. Galvanizers are showing more interest in the market but very little spelter has been bought recently by the brass mills. Spelter has declined 1c and is quoted at 18c per pound.

Lead.—The market is dull and weak. The "Trust" price has declined to 7c New York, and on the outside market is lower for both spot and futures. Over production has caused the decline. Lead has declined ¼c and is now quoted at 9c per pound.

Antimony. — Prices have again declined and there is no demand at present and prices are purely nominal. Smaller consumption combined with increased competition has been the cause of the decline. Quotations are nominal at 35c per pound .

Aluminum. — The market is firmer but quotaions are unchanged at 64c per pound.

ARMSTRONG-WHITWORTH PLANT EXTENSION

THE Armstrong Whitworth of Canada, of which M. J. Butler, C.M.G., is managing director, and Lawrence Russell, secretary-treasurer and sales agent, have given out contracts for the doubling of their already extensive plant at Longueuil by the expenditure of three quarters of a million dollars. Mr. Butler states the present floor space of 50,000 square feet will have been increased to 100,000 square feet on completion of the contracts just given and expects that if all goes well the new unit will be roofed in by the month of September and the machinery installed a few months later.

At present all the available space is being utilized and while 250 men are now employed in the different departments, the number will in all probability be increased to 500 when the new buildings are completed and the machinery in running order. Besides the coming additions a new storehouse and office building will be erected.

The new addition will comprise a plant for the manufacture of steel tires for locomotives and passenger rolling stock as well as for the rolling of steel wheels and the manufacture of forged axles. They will likewise add a rolling mill and provide for the making of special rounds and shapes from electric smelted steel. This is the first time we understand that the manufacture of steel wheels has been undertaken in Canada, and it is being done to meet the now heavy demand for such wheels which are necessary to carry cars of seventy-five tons weight.

The contract for the steel work has been given to the Dominion Bridge Co., and the remaining work to The John Quinlan Co. In fact most of the new extension is to be done by Canadian firms, although a part of the machinery will be manufactured by the Morgan Engineering Co., of Alliance, Ohio, who are experts in all matters pertaining to rolling mills.

Mr. Butler says that the market for the company's goods has gradually expanded since the opening of the plant, hence the decision to spend an additional three-quarters of million dollars on a new addition.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

YARROW'S, ESQUIMALT, B.C.

RECENT work carried out at Yarrow's shipbuilding yard at Esquimalt, B.C., is indicative of considerable activity. In addition to a great deal of foundry work carried out for the Victoria Chemical Co. and others, the following list covers vessel overhauls and repairs, etc:

Steel sternwheeler under construction.

Sir John Jackson's hopper SS. Hercules No. 7, docked on slipway, underwater portion of hull cleaned and painted, and some damaged shell plating repaired.

C. P. R. SS. Princess Charlotte docked in the Dominion Government drydock; underwater portion of hull cleaned and painted.

Salvage steamer Alaskan docked on the slipway; underwater portion of hull cleaned and painted, and some hull and engine repairs executed.

Collier SS. South Pacific docked in the Dominion Government drydock; underwater portion of hull cleaned and painted.

C. P. R. SS. Princess Alice docked on slipway; underwater portion of hull cleaned and painted, together with small hull repairs.

Dredging fleet vessels tug Point Ellice, dredge Ajax and dredge Victoria docked on slipway for annual overhaul and repairs.

C. G. S. Newington locked on slipway; underwater portion of hull cleaned and painted.

Cable ship Restorer; the installation of oil fuel burning system completed.

Union Steamship vessels SS. Camosun; extensive bottom damage repairs carried out, together with engine overhaul.

LACHINE CANAL MAY TRAFFIC

BECAUSE shortage of available tonnage has greatly curtailed the amount of coal being brought up to Montreal and St. Lawrence ports by ocean and coasting steamers from the Maritime Provinces, the May returns for the Lachine Canal show an increase of 100,890 tons of coal in the amount brought down from American ports as compared with the coal brought down for the same month in 1915.

This coal has been an absolute necessity for many firms who are now running their factories day and night, but it has also had the effect of limiting to a certain extent the lake vessel tonnage available for bringing wheat down to Montreal from the Upper Lakes. This tonnage had already suffered a notable diminution because of the vessels suitable for

ocean navigation which had been tempted to abandon the Lakes for the more profitable business at sea.

So far as the Canadian West was concerned, the situation was saved last year by American vessels, which rushed all the wheat they could to American lake ports, whence it was taken by rail to American Atlantic ports to swell their returns as to wheat exports. The Canadian railroads have also done yeoman service in sending long caravans of trains eastward laden with grain, and these trains are estimated to have brought more grain to the elevators of the harbor commissioners than have the boats, even though in normal times the greater part of the grain passes first through the Lachine Canal.

Grain Carried

The amount of wheat which came through the Lachine Canal in May this year is less than a quarter of what it was for the same month in 1915. The figures are as follows: May, 1915, 8,632,-508 bushels; May, 1916, 1,865,468 bushels; a decrease of 6,767,040 bushels.

The total amount of grain which came through the canal in May for 1915 and 1916 respectively was 11,480,252 bushels and 4,068,227 bushels, an advantage for 1915 of 7,412,025 bushels of grain. The only increases shown were in the cases of barley, of which 487,206 bushels came through the canal, against 114,863 bushels in May, 1915, and rye, of which 132,000 bushels came through into Montreal, as against none at all in 1915 for May. Other figures for May, 1915 and 1916 respectively, are as follows: Corn, 415,041 and 185,340 bushels; oats, 2,200,-840 and 1,298,615 bushels; flaxseed, 117,-000 and 99,598 bushels; decreases in every case. This decrease occurs at a time when there is lots of wheat to ship and the port in a splendid position to handle it.

The total coal received in the harbor through the Lachine Canal last month was 245,842 tons, as against 144,952 tons in May, 1915, or an increase of 100,890 tons.

General Produce

In the statistics of produce carried there are decreases in every item except cheese, which increased from 15,498 boxes in May, 1915, to 18,649 boxes of cheese in May, 1916, an increase of 3,-151 boxes. In other items the disparity is most startling in the case of flour where 22,639 sacks were brought down the canal in May, 1915, and none came last month. Figures for May in the two years being considered were as follows for the other items: Eggs, 4,469 cases in 1915 and 4,186 cases last month; butter, 567 packages in 1915 and 308 packages last month; apples, 83 barrels in 1915 and none last month.

Vessel Trips

In considering the number of trips made by vessels through the Lachine Canal the following figures show a steady diminution ever since the year 1913 for May: 1910, 1,256 trips; 1911, 1,173 trips; 1912, 1.051 trips; 1913, 1,307 trips; 1914, 1,292 trips; 1915, 1,070 trips; and 1916, for May, 968 trips. Thus, the surprising result is shown that the Lachine Canal was used by fewer vessels last month than it had been for the same month six years ago or any year since.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Hamilton, Ont.—The W. T. Rawleigh Co., will proceed with the erection of a factory here.

Hamilton, Ont.—The Canadian Steel & Wire Goods Co., will build an extension to their factory.

Oshawa, Ont.—The McLaughlin Motor Car Co., and the Chevrolet Motor Car Co., contemplate making extensive developments to the factory here.

Fassett, Que.—The Standard Chemical Iron & Lumber Co. is building a new factory to replace the one recently destroyed by fire with a loss of $75,000.

Joliette, Que.—The Joliette Steel Co., has purchased a building which is being remodeled for the manufacture of castings by the converter process.

Stratford, Ont.—The R. M. Ballantyne Co. will build a power plant at a cost of $10,000, and will install new engines, boilers, and other accessories.

Hull, Que.—The Hull Iron & Steel Foundries, is building an addition, 90 x 150 ft., to its foundry, at a cost of $30,000, to be used as a small castings department.

Vancouver, B.C.—The Granby Consolidated Mining & Smelting Co., will install a steam power plant at the Anyox smelter to be used as an auxiliary during the winter.

Clayburn, B.C.—Large extensions are being made to the plant of the Clayburn Firebrick & Clay Co., which will require machinery to double the capacity of the plant. W. H. Armstrong is president.

Hamilton, Ont.—The Peerless Weaving & Belting Co. has leased the factory of Ludlam-Ainslie Co., and will instal machinery for the manufacture of leather belts, automobile accessories, etc.

Simcoe, Ont.—L. Frick & Son, will be in the market for the following machinery for a planing mill which is being erected there: Planer, sticker, rip-saw, rip-table, one 40 h.p. motor, shafting, belting, etc.

Vancouver, B.C.—The Nicola Mining & Smelting Company's property at Stump Lake, near Kamloops, has been acquired by a Seattle syndicate. New machinery will be installed including a 100-ton concentrator.

Dartmouth, N.S.—The Williston Steel Foundry, Halifax, N.S., is building a foundry here for the manufacture of crucible steel castings. The furnaces to be installed will be of the patent tilting design, using coke for fuel under forced draft. The plant will cost $16,000.

Hamilton, Ont.—The controlling interest of the Maple Leaf Auto & Supply Co., has been secured by W. Ellis, who is having a plant erected on Barton St. for the manufacture of metal garages, gasoline tanks, automobile parts, metal specialties, etc. H. J. Wise is manager.

New Toronto, Ont.—The new factory which the Goodyear Tire & Rubber Co., propose building here will cost about $1,500,000. The plant will cover a site of 27 acres and the main building will be 560 ft. long by 100 ft. wide with four floors and basement.

Victoria, B.C.—A bond guarantee for $40,000 has been given the French Complex Ore Production Co. to enable it to construct an electrolytic zinc smelting plant at Nelson. The company agrees to lease the old Fairview zinc plant and to operate it for the purpose of developing and commercially demonstrating its process for the treating of complex ores.

Essex, Ont.—A new tractor company to be known as the Doyle-Dennert Tractor Co., has been formed here and has been incorporated with a capital of $150,000. Dr. Doyle is president, W. G. Doyle, vice-president, W. J. Nesbitt, secretary, and Mildred Dawson, treasurer. E. C. Dennert is general manager. The company purposes manufacturing tractors for agricultural purposes and for scraping roads.

Vancouver, B.C.—The Slocan Star Mines, are pushing construction of the aerial tramway to connect the mine with the C. P. R. terminal at Sandon. The additional machinery for the mill is being received, and will shortly be installed, making a better separation of the zinc and lead products, and enabling higher grade concentrates to be shipped. Arrangements are being made to construct a power plant at Sandon, to be ready for operation by the period of low water in the fall. This plant will enable the mill to be operated all the year round.

Vancouver, B.C.—The Tonopah-Belmont Development Co. are constructing a dam at the Surf Inlet mine on Princess Royal Island. This dam will supply power to develop 1,500 h.p., and as soon as this power is available the installation of the first unit of the mill and mining plant will be pushed forward. It is proposed to construct an electric railway to connect the mine with the head of navigation, so that the machinery can be placed on the ground. A transmission line to convey power from the new power plant to the mine will have a length of seven miles.

Chicoutimi, Que.—The Ha Ha Baie Sulphite Co., has awarded a contract for the construction of a paper pulp plant at Bagotville, Que., to the J. G. White Engineering Co., of New York. Work on the site, which is on Ha Ha Bay on the Saguenay River, and which will occupy about five acres, has been begun and it is expected that the plant will be producing pulp early in 1917. The initial installation will have a capacity of 120 tons of sulphite pulp per day. J. E. A. Dubuc is president of the Company.

Vancouver, B.C.—The Canada Copper Corporation, which is the holding company for the British Columbia Copper Co., has important plans for the equipment of the Princess Alice camp on Copper Mountain, and its addition to the copper producers of the province. The plans provide for an outlay of $2,500,000 on the erection of a mill, and the installation of transportation and mining equipment. A working tunnel will be driven to open up the ore deposits for the economic extraction of the ore, and this will be connected with the surface by the shaft which is being deepened to the tunnel level. This tunnel will be 2,000 feet in length. The work will be completed by fall, and $400,000 has been set aside to cover the cost.

Electrical

Palmerston, Ont.—Hydro-electric power was inaugurated here on June 6.

Scarborough, Ont.—The Scarborough Township Council contemplate installing a hydro-electric system. The Village of Agincourt will be included in the system.

Niagara Falls, Ont.—Arrangements are being made by the Stamford Township Council to submit to the voters the proposal of the Hydro-Electric Commission to purchase the lines of the Ontario Distributing Co. in Stamford and Niagara townships.

If any advertisement interests you, tear it out now and place with letters to be answered.

General Industrial

Hamilton, Ont.—The Mercury Mills will build a factory here.

Brantford, Ont.—The Royal Paper Box Co., will build a factory at a cost of about $12,000.

High River, Alta.—The co-operative farmer's elevator at Federal has been destroyed by fire which started in the engine room.

New Westminster, B.C.—The Candian Products a newly organized concern, has taken over the business of the Duchesnay Packing Co. at Ladner, and will build an evaporating plant at a cost of about $30,000.

Municipal

St. John, N.B.—The city council proposes to make extensions to its waterworks plant and system to cost $230,000.

Sherbrooke, Que.—The City Council has passed a by-law making it compulsory for all manufacturing plants in the city using soft coal to install smoke consumers.

Winnipeg, Man.—The city council will apply to the Dominion Government for a lease of Slave Falls on the Winnipeg River in order to make further extensions to the city's power department.

Tenders

Toronto.—Tenders will be received by the Board of Control, up to July 4, 1916, for the supply and delivery of one 8-in. water-meter. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Vancouver, B.C.—The undersigned will receive tenders up till June 28, for the purchase of the following lap welded steel pipe, manufactured by the National Tube Co., Pittsburg, Pa.; 20,000 lin. feet 6-in.. 45,000 lin. ft. 8-in.. 10,000 lin. ft. 12-in. James Stuart, City Purchasing Agent.

Toronto, Ont.—Tenders addressed to the secretary-treasurer of the Board of Education, will be received until June 15, 1916, for oil-burning apparatus for steam boilers at Earl Grey school, and self-feeding, coal burning apparatus for boilers at Queen Alexandra school. Specifications may be seen and all information obtained at the office of the superintendent of Buildings, City Hall, Toronto.

The Pas, Man.—Tenders, addressed to H. H. Elliott, M.D., secretary-treasurer of the town of The Pas., Man., will be received up to June 22, 1916, for the supply and delivery of the following machinery and materials:—Tender "A"—For the supply and delivery of two sewage life pumps. Tender "B"—For the construction of a sewage lift chamber. Plans and specifications may be seen at the office of Murphy & Underwood, consulting engineers, Saskatoon, Sask., and the resident engineer, The Pas, Man.

Toronto, Ont.—Tenders will be received up to June 20, 1916, for the supply of the following 3 motor combi:nation hose and chemical engines; 1 motor tractor for hook and ladder at Ossington avenue fire hall; 1 motor truck for delivering supplies and hauling coal for fire engines; 1 motor combination salvage and chemical truck; 1 motor hook and ladder truck. Specifications of the above can be seen and forms of tender obtained upon application at the office of the Fire Department, Adelaide street fire hall, Toronto.

Contracts Awarded

Toronto, Ont.—McGregor & McIntyre will supply the steel work for the Goodyear Tire & Rubber Co., factory at New Toronto.

Walkerville, Ont.—Wells & Gray, of Toronto, have been awarded the general contract for the new Collegiate Institute at $165,000.

Guelph, Ont. — Contracts have been awarded to Secord and Son, for an addition and alterations to the chemical building at the Ontario Agricultural College. The alterations will cost about $15,000, and an immediate start is to be made.

Orillia, Ont.—The Water, Light and Power Commission have awarded the contracts for the electrical machinery for the new power plant at the Swift Rapids to the Canadian General Electric Co. The contract price for two units, with a capacity of 3,600 h.p., is $68,000: for three units, with a capacity of 5,400 h.p., $81,000. The decision as to whether two or three units shall be installed has been deferred until the negotiations with the Hydro-Electric Commission for supplying them with the additional power required by their Severn system have been completed.

Refrigeration

Kaslo, B.C.—P. Burns & Co. will equip their branch market at Kaslo with a 1-ton Armstrong refrigerating machine.

Riondel, B.C. — The New Canadian Metals Co., is having installed a 1-ton refrigerating and ice making plant furnished by the Armstrong Machinery Co., Spokane, Wash.

Silverton, B.C.—Herman Clever will have his meat market equipped with a 1½-ton refrigerating machine, furnished by the Armstrong Machinery Co., Spokane, Wash.

Ford, Ont.—The Westgate Ice Cream Co., it is reported, has had its ice cream factory equipped with a 6-ton "York" refrigerating plant and dry hardening system.

Vancouver, B.C. — The Ocean Falls Pulp & Paper Co., will install a 7-ton refrigerating machine, contract for which was let to the Armstrong Machinery Co., Spokane, Wash.

South Vancouver, B.C. — P. Barker is having his meat market equipped with a 3-ton refrigerating machine, furnished by the Armstrong Machinery Co., Spokane, Wash.

Bella Bella, B.C. — The East Bella Bella Cannery, north of Vancouver, is having its cannery equipped with a 5-ton refrigerating machine, contract for which was let to the Armstrong Machinery Co., Spokane, Wash.

Trade Gossip

Lyall Board Re-elected.—At the annual meeting of the P. Lyall & Sons Construction Co., held in Montreal recently, the board was re-elected as follows: William Lyall, president; Traill Oman Lyall, vice-president; J. N. Greenshields, K.C., the Hon. Robert Mackay, H. Wyndham Beauclerk, John McKergow.

The Metals Coating Co., of Canada are operating a demonstrating laboratory at 90 St. James street, Montreal, for the purpose of demonstrating the "Schoop" method of metallic deposition. The company have the exclusive rights in Canada for this process which is being operated under the supervision of T. Stansfield Worthington, who has for some time been associated with its development.

Steel Co. of Canada.—It is expected that the Steel Company of Canada will soon complete the installation of its three new open-hearth furnaces, also its presses for the manufacture of 8-inch and 9.2 inch shells, and will then begin to operate same. The three new hearth furnaces will increase the output of steel by 300 tons per day, or about 33 1-3 per cent. It is understood that the output will then be at the rate of 1,200 tons of steel per day. The company is also making further extensions involving an expenditure of $1,000,000 during the pres-

Have you ever asked the question: "What assurance have I that this pay-roll is OK?"

Right off the bat we make this statement: "Any 'OK' you may have is from a 'human factor,' and unless you use an International Time Recorder, you have no REAL protection."

It's a cold-blooded, unfriendly machine. It can't think, and it can't make mistakes. All it does is to see that you get every minute of working time you pay for.

Printed, unchangeable time records are made automatically, under lock and key, and these form your weekly pay-roll sheets.

Your business may be unusual, but we can give you a Time and Cost-Keeping System that will exactly fit it. We are the largest makers of Time Recorders in the World. Write us to-day for new folders and prices.

OUR SERVICE DEPARTMENT. We maintain a Service Department at our factory, that is at the call of our users at any minute. This Department employs only expert mechanics, thoroughly trained on the mechanism of all our recorders. We urge our customers to have their time recorders inspected at regular intervals.

International Time Recording Company of Canada, Limited

Toronto: Anderson St. **F. E. MUTTON, Manager**

Montreal: W. A. WOOD, Sales Agent
Corner McGill and Cartier Streets

ent year. Work on hand will mean operating full time well into 1917.

Canadian Timber Values.—According to a recent Commerce Report the values of the various classes of timber produced in Canada in 1914, together with the values of the forest products, total $176,672,000, being divided as follows: Lumber, lath and shingles, $67,500,000; fire wood, $60,500,000; pulpwood, $15,500,000; posts and rails, $9,500,000; cross ties, $9,000,000; square timber exported, $400,000; cooperage, $1,900,000; poles, $700,000; logs exported, $850,000; tanning material, $22,000; round mining timbers, $500,000; miscellaneous exports, $300,000; miscellaneous products, $10,000,000.

Quebec Bridge Progress.—At the close of last year's work, there had been 46,000 tons of steel erected in the North Shore anchor and cantilever arms of the Quebec Bridge. As the total steel in the bridge will come to 65,000 tons, approximately 19,000 tons yet remain to be placed. The South Shore cantilever arm was started in April, 1916, and three weeks later the first panel adjacent to the main pier was well under way. The South Shore cantilever arm will be finished by September, 1916, when the bridge will be in readiness for the floating and hoisting of the suspended span. This span is 640 feet long, and 88 feet wide, and weighs, in the floating condition, approximately 5,000 tons.

Language Difficulty.—To overcome the language handicap, a lectureship in Russian has been endowed in Sheffield University. Liverpool University has had a Russian chair for fifteen years, and the Birmingham Chamber of Commerce has invited donations towards the endowment of a chair of Russian in Birmingham University. In Glasgow the Chamber of Commerce some time ago asked for subscriptions towards a fund of $2,500 for the establishment of prizes or scholarships to enable young men of approved qualifications to reside in Russia with a view to acquiring proficiency in the language, and a Russian class was opened at the Glasgow and West of Scotland Commercial College. For some reason or other the Glasgow public did not display much appreciation of the scheme, for less than $1,500 was subscribed. Birmingham has raised $40,000.

The Chemical Market.—The signs of stiffening in the markets for sulphuric acid, benzol, totnol and other explosive making bases are noticed, says, a New York despatch. The improvement is attributed to the prospect of large orders for such materials being placed within the next few weeks. For some time the markets for these chemicals have been dormant, but of late a steady inflow of small orders has been reported. While no definite inquiries for large tonnages have appeared, the trade has been given reason to expect that Russia, France, and possibly Great Britain will ask for bids on explosives and explosive ingredients in the near future. It is pointed out that the consumption of explosives by the belligerents has been enormous of late. The Verdun conflict, the Skager Rack fight and the new Russian offensive have consumed masses of such supplies and the Allies must renew purcheses abroad.

Railways—Bridges

Kelowna, B.C.—The C. N. R. will probably start construction of the proposed branch from Kamloops to Okanagan, this summer.

Vancouver, B.C.—Construction work on the Pacific Great Eastern Railway is to be started at both ends of the line as soon as sufficient men can be assembled for the work.

Personal

George A, Slater, shoe manufacturer, was elected chairman of the Montreal branch of the Canadian Manufacturers' Association.

Sir William Price, who is leaving for England in command of his battalion, is, it is understood, giving up the chairmanship of the Quebec Harbor Commission.

C. C. Johnston, of London, Ont., formerly resident engineer here for Chipman & Power of Toronto has joined the Canadian Copper Co. at Sudbury, Ont.

Sir George E. Foster, Minister of Trade and Commerce, has arrived in London, England. Sir George, who has been made a Privy Councillor, will attend the Allies Economic Conference at Paris with other representatives of the British Government.

Charles R. Scoles, a prominent railroad man of New Carlisle, Que., died recently in Bermuda. The deceased was born at Grantham, England in 1856. He was connected with various railway enterprises in Eastern Canada. In 1890 he was appointed manager of the Salibury & Harvey Railway. In 1900 manager of the Atlantic and Lake Superior Railway and in 1911 manager of the Quebec Oriental and Atlantic, Quebec and Western Railways.

Sir Hay Frederick Donaldson, who was recently lost on H.M.S. Hampshire, was technical adviser to David Lloyd George, Minister of Munitions. He visited Canada last fall on the invitation of D. A. Thomas (Baron Rhondda) to study the possibility of manufacturing heavy ordnance in this country. He was formerly chief superintendent of ordnance at Woolwich Arsenal and was prominent in the engineering world, being past president of the Institute of Mechanical Engineers and a member of the Iron and Steel Institute, and of various engineering societies. He was born in 1856.

New Incorporations

The Maple Leaf Tires has been incorporated at Ottawa, with a capital of $500,000 to manufacture tires and rubber goods of all kinds. Head office to be situated at Toronto. Incorporators: H. C. Long, R. K. Grimshaw, and E. J. Swift, all of Toronto.

Woodsplitter, Ltd., has been incorporated with a capital of $100,000 to manufacture certain machines designed to saw, split and otherwise prepare wood and lumber. Head office at Toronto. Incorporators, A. E. Cooper, C. Allan and R. McCulloch all of Toronto.

The Port Hope File Mfg. Co., has been incorporated at Toronto with a capital of $40,000 to carry on the business of machinists, iron founders, and file makers at Port Hope, Ont. Incorporators, W. G. Brown, W. Embleton and E. G. Fogarty all of Port Hope.

The Tobacco Products Corp. of Canada, has been incorporated at Ottawa with a capital of $250,000 to manufacture tobacco products and by-products. Head office to be situated at Montreal. Incorporators, A. Wainwright, A. H. Elder and F. W. Hackett all of Montreal.

The Canada Stove & Foundry Co., has been incorporated at Ottawa with a capital of $1,500,000 to carry on the business of iron masters, steel makers, Head office to be situated at Montreal, Que. Incorporators, E. R. Parkins, R. E. Allan and F. W Tofield all of Montreal

La Compagnie Chs. A. Julien, has been incorporated at Quebec with a capital of $145,000 to manufacture and repair all kinds of machinery and agricultural implements, etc., at Port Rouge, Que. The incorporators are Chs. A. Julien, Odilion Riche and Celien Delisle, all of Port Rouge, Que.

The Barnes Construction Co. has been incorporated at Ottawa, with a capital of $5,000, to manufacture automatic sprinklers, fire extinguishing and fire prevention apparatus of all kinds. Head office to be situated at Montreal. Incorporators: F. G. Bush, F. B. Common, and G. B. Drennan, all of Montreal.

The St. John Dry Dock & Shipbuilding Co., has been incorporated at Ottaway with a capital of $1,000,000 to carry on the business of a general contracting construction and developing company for the construction and equipment of public works. Head office to be situated St. John, N.B. Incorporators, R. T. Heneker, H. B. Chauvin and H. E. Walker all of Montreal.

The Canadian Forestry Products, has been incorporated at Ottawa with a capital of $9,500 to carry on business as manufacturers, of pulp wood, cord wood and other forestry supplies together with aal by-products including wood, alcohol and all chemical products and compounds. Head office to be situated at Montreal. Incorporators are L. H. Boyd, A. R. Johnson and Arthur Ross all of Montreal.

Building Notes

Galt, Ont.—The Bell Telephone Co., contemplate erecting a new exchange building here.

Winnipeg, Man.—The Stovel Co., has begun the construction of its new printing plant at the corner of Dagmar and Bannatyne avenue, to replace the building recently gutted by fire. The new plant will be eight storeys, three to be rushed to completion at a cost of $200,000 for present requirements. These initial three storeys will have a floor space of 84,000 square feet.

Wood-Working

Elmira, Ont.—A one-storey concrete building, 70 x 90 ft., is being built by Bauman & Letson, to replace their planing mill recently destroyed by fire.

Marine

Lunenburg, N.S.—John McLean & Sons, expect to start work shortly on a steamer intended to replace the wrecking steamer Bridgewater. Both shipyards are pretty well filled up with work at present.

Catalogues

Electric Tools.—The Stow Mfg. Co., Binghampton, N.Y., have issued a new booklet entitled "Portable Tools of Proven Value." The booklet is fully illustrated and contains descriptive matter covering various types of portable electric tools, motor-shaft combinations, flexible shafts of all sizes, etc.

Rotary Surface Grinders made by the Persons-Arter Machine Co., Worcester, Mass., are illustrated and described in a Bulletin recently issued. The model A type which is the subject of this Bulletin is shown in 8 in. and 12 in. sizes. The principal features embodied in the construction of this grinder are explained in the reading matter and also by means of drawings reproduced. A specification is also included.

Gate Valves.—The latest catalogue issued by the Nelson Valve Co., Philadelphia, Pa., deals with extra heavy steel gate valves for superheated steam and other power plant service. This is a very comprehensive booklet on the subject and is a handy reference for specifications and prices. The various types of valve are illustrated and described while tables give the price and principal dimensions for each size. Copies of this catalogue will be gladly furnished on request.

A Manual for Operating Lodge and Shipley Lathes is the title of new Bulletin No. 140, issued by the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio. This manual is for the operator's guidance in using Lodge & Shipley engine lathes and attachments. It gives brief descriptions of different parts of the lathe, instructions for operating, suggestions for handling work and grinding tools, etc. All parts of the lathe are described in detail and exceptionally clear half-tones and diagrams show the general construction. This is an extremely useful manual for users of this type of lathe, who may obtain copies by writing the Lodge & Shipley Machine Tool Co.

Regenerating Sulphated Accumulator Electrodes.—In the course of a research on lead sulphate and lead, G. A. Perley and C. W. Davis, of Durham College, New Hampshire, observed that sulphated electrodes of secondary batteries could be regenerated by being placed in caustic soda, without the use of an external current. The method, however, was not satisfactory, and after trying various solutions — sodium sulphate, chlorate, phosphate, carbonate, tartrate, etc., with or without the addition of caustic soda—they found that the old method of regeneration by sulphate of sodium was, after all, the best. They advise the placing of two additional positives next to the two outer negatives, in order to hasten the regeneration of these latter electrodes. The regeneration is effected by supplying the ordinary charging current for about 60 hours.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, JUNE 22, 1916 No. 25

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.

H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,

A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 22 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 12960. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago, Telephone Randolph 3234. Mr. R. G. Langrill, 3112 Euclid Ave., Cleveland, Ohio, Tel. Prospect 1026F.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $3.00 a year; United States, $3.50 a year; other countries, $4.00 a year; Single Copies, 15 cents. Invariably in advance.

INDEX TO ADVERTISERS

Manufacturing the Six Inch High Explosive Shell

Staff Article

The accompanying article may be reckoned as the first of a series dealing with the larger type shell now being produced in numerous Canadian metal-working plants, and while the equipment detail and operation methods employed differ somewhat from those relating to the shrapnel and small high explosive, it will be clearly evident that experience of these latter has contributed in no insignificant degree to the bigger shell production achievement.

THE manufacture in Canada of the heavier class of shells promises to equal, if not surpass, the remarkable record made in the production of the smaller types. Although the successful manufacture of the larger shells necessitated the installation of much heavier equipment than previously needed, many shops in various parts of the Dominion are now producing and shipping. In many respects, the processes of production on all shells are similar, but the equipment and method of handling, as well as various other details differ to a great extent.

The accompanying article was compiled from data personally secured in one of our leading metal working plants.

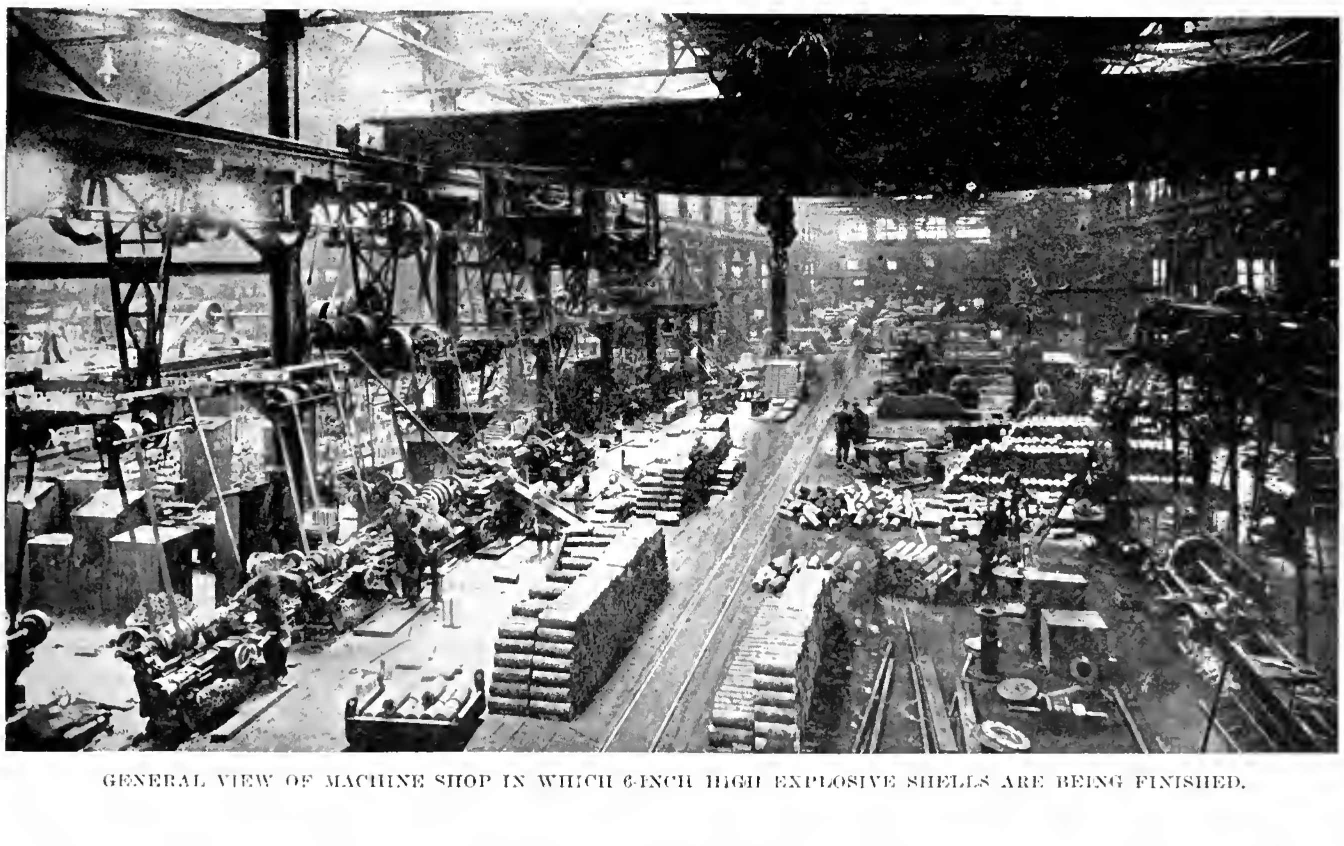
Casting and Forging the Billet

Two methods of producing the steel billet (from which the shell is forged), are being employed, the billets are cut from a rolled bar or are produced directly from a cast ingot. While a great quantity of shells are made by the former process, the greater proportion, especially of the larger sizes, are produced by means of the latter. When the latter process is adopted, the specifications call for an amount of metal to to be cut from the upper end of the ingot, equal to 20 per cent of it's length, to obviate "pipe" and blowholes. For this reason it is necessary to prepare much more metal than actually required, as the steel in each ingot will be approximately 22 pounds in excess of that needed to make the shell. After the ingots have been cast, the top portion is parted down to a section in the center equal to about 20 per cent of the cross sectional area, this portion being afterwards broken off for examination of carbon content and fracture.

The billets are next placed in a crude oil furnace, 30 at a time and heated to a temperature of about 2,100 degs. F. It is essential, to best results, that the billets be heated to the proper temperature, and evenly throughout. When the billets are unevenly heated there is the possibility—especially if the forging punch should be a little loose, of producing a shell having eccentric walls. When the billets are sufficiently heated, they are removed from the furnace with a long pair of tongs, and, by aid of an overhead monorail which supports the billets and tongs, are carried to an adjoining press for forging. Before the billet is placed in the die, however, it is dropped on a large plate, where the scale on the surface is quickly removed with scrapers.

The billet is now raised from the plate and dropped in the die, which is about 1-16 in. larger than the heated billet. Just before the punch descends, a small quantity of coal dust is thrown on top of the billet, the purpose of this being to create a gas below the punch which aids in its withdrawal after the billet has been pierced. Sometimes however, the punch will have a tendency to lift the shell from the die, in which case, provision is made for stripping the shell by means of a plate working in slides on the top of the die. All presses are equipped with water sprays and streams for cooling the punches and dies. Punches are lubricated with plumbago and oil; and under favorable conditions will produce from 200 to 300 shells before renewing.

This shop is equipped with seven 200-ton Wood presses, which have a capacity of 250 shells each in 8 hours—



GENERAL VIEW OF MACHINE SHOP IN WHICH 6-INCH HIGH EXPLOSIVE SHELLS ARE BEING FINISHED.

shop operating on three shifts of 8 hours each. Ferguson furnaces are used throughout, and to insure continuous operation, three furnaces serve each 6 inch press. An approximate estimate of production in this plant is about 4500 forgings for 6 in. shells per day. In addition to the 6 inch shell equipment, this plant is making 8 inch and 4.5 inch shell forgings. One 350 ton press operates continually on 8 inch, and several are working on the 4.5 inch shells. Four 350 ton accumulators loaded with iron ore and slag are operated by four geared Dean pumps, direct driven by 200 h.p. C. G. E. motors.

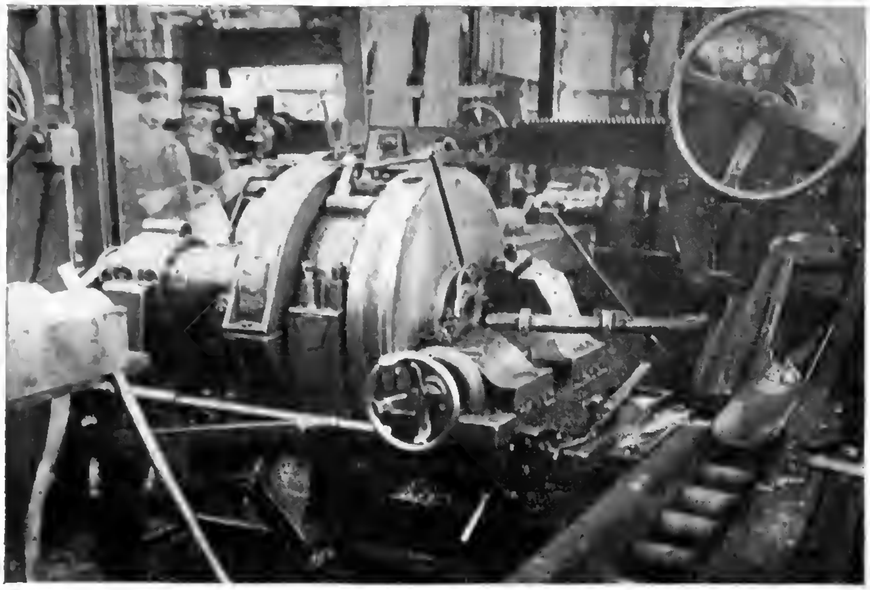


FIG. 1. LAUGHLIN-BARNEY CUTTING-OFF MACHINE TRIMMING OPEN END OF SHELLS.

Machining The Shells.

After the shells have cooled from the forging operation, they are taken to another department and inspected for concentricity of wall thickness, length and surface defects. Those shells which have developed faults from the forging process are placed to one side for future consideration. The percentage of rejected shells at this stage however, is very small; in fact, some of those that are discarded are later found to come within the limit of tolerance. As the shells are inspected, they are placed in separate piles, those of the same heat being kept in one pile. As the rough shells accumulate very fast, and there arises the possibility of the series becoming mixed, each lot is stenciled with red paint, before passing on to the machining operations. Fig. 1 shows a general view of shop where preliminary inspection takes place.

Cutting Rough Shells to Length

The first machining operation on the 6 inch high explosive shell is that of cutting-off the open end. This is performed on eight Laughlin, Barney Machine Co. cutting off machines, one of which is shown in Fig. 1. The shell is placed on the wooden block which travels on wood rollers, and is then slid forward. The table is of such a height that the bore of the shell passes over the swinging arm carried in the bracket which is moved along the rail above the machine by means of a rack and pinion. A stop is arranged on the rail so that the swinging arm acts as a gauge for setting the shell in proper position in the chuck. Each machine is capable of handling from 80 to 100 shells per day of 10 hours.

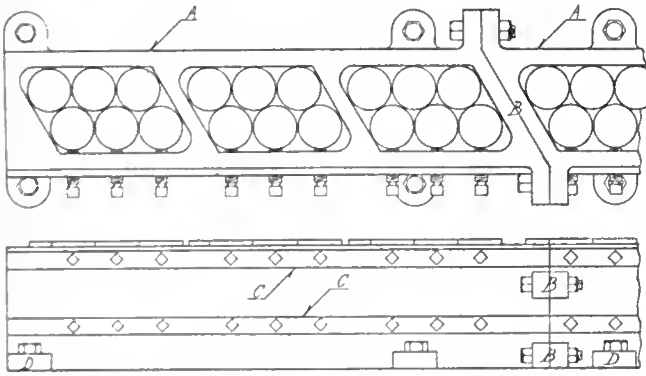


FIG. 2. PLANER JIG FOR FACING SHELL BASES.

Roughing-off the base is the second operation. There are at present four large Niles-Bement-Pond planers working on this operation, in addition to several lathes. A sketch of the jig used for holding the shells while facing off the base is shown in Fig. 2. Two jigs are used on each planer, made up of two sections and joined together as shown at B. The jig is secured to the table by means of the lugs D, the frame being reinforced for the clamp screws by the ribs C. When two heads are used—which is possible when the cut is not too heavy—the load of 72 shells can be finished in approximately 3 hours. However, it sometimes happens that the amount of stock to be removed will be about 1¼ inches, in which case it is found necessary to use only one head, so that the time required to complete one load may take from 5 to 6 hours.

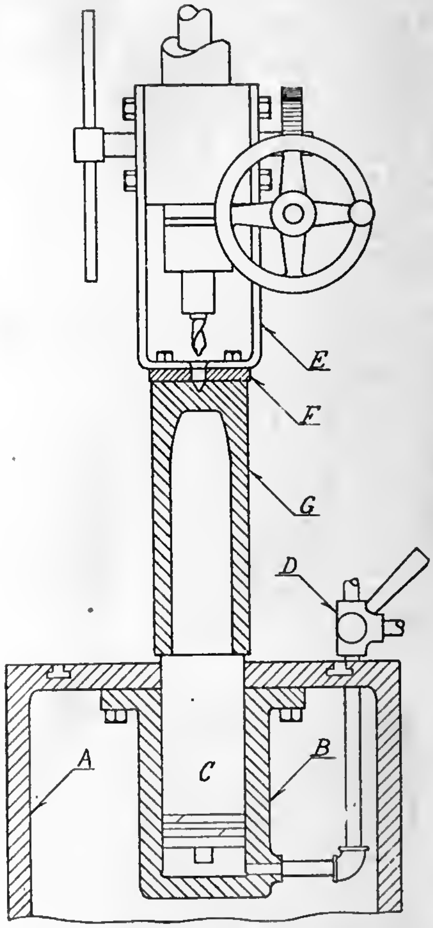


FIG. 3. CENTERING SHELL BASE ON DRILL PRESS.

Centering the Base on Drill Press

The third operation, that of centering the base, is accomplished in an upright drill press. An interesting feature in connection with this operation is the method of gauging and handling the work. The shells are placed upon the table of the machine, which is of the square box type, and fitted with an air cylinder secured to the lower part of the table, as shown in Fig. 3. The piston C, when released, comes just below the level of the table, so that no obstruction is offered when the shell is being moved into position. When the shell is in the

desired location, air is allowed to enter the cylinder B, by operating the three way valve D, and the shell is forced up against the gauge disc F, which is secured to the bracket E, which is bolted to

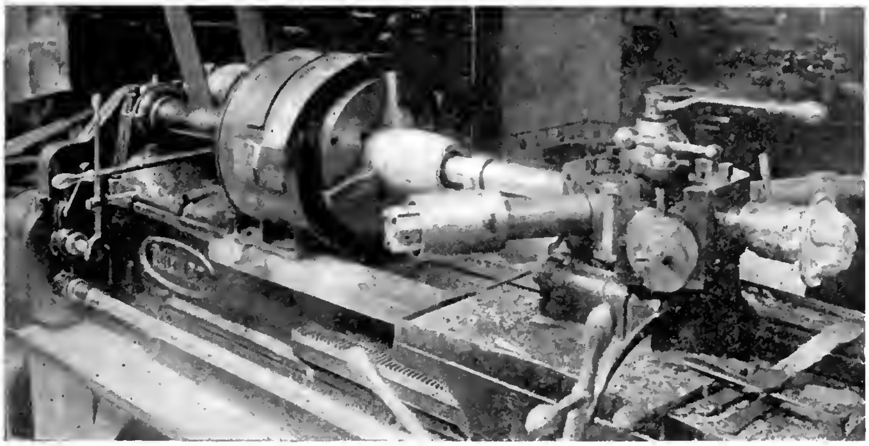


FIG. 4. SHELL FACING, BORING AND TAPPING ON BULLARD LATHE.

the drill press frame as shown. Owing to slight variation in the diameter of the rough shell, the flat disc was adopted, and for this reason it is sometimes nec-

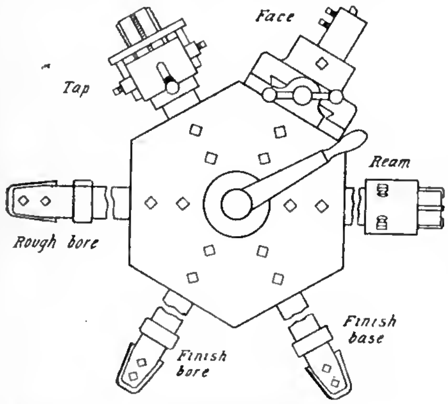


FIG. 5. TOOL ARRANGEMENT FOR SHELL BORING.

essary to apply the air a few times before the shell is in a central position.

Rough Turn and Bore

When the shells have been centered, they are subjected to the rough turning operation, which is performed on twenty-six LeBlond heavy duty engine lathes. Machining the cylindrical portion of the 6 inch shell is very similar to that of the smaller shells; the body being rough turned to a diameter of about 6.2 inches over the entire length, and the profile of the nose contour roughly formed. It is occasionally found necessary, due to excessive wall eccentricity, to rough out the interior of some shells before the final boring operation.

Face, Bore and Tap

The sixth operation is that of machining the bore. Twenty-four Bullard single purpose machines are used on this, a general view of one of these being shown in Fig. 4. The interior of the shell is completely finished at this setting, and the cycle of operations is as follows:—Placing shell in chuck, which is of the three jaw universal type; rough boring to a diameter of about 3.58 inches by a flat cutter held in a long rigid boring bar; rough lower tapered section at base of shell which recedes from 3.58 to 2.7 with a corner radius of 0.8 inches; finish bore to a diameter of between 3.62 and 3.64, with corresponding dimensions for the lower tapered portion. The section at the nose of the shell for the socket thread is now reamed, the nose being afterwards faced off to the desired dimensions: This last operation is accomplished by means of a tool held in a short bar, which in turn is firmly secured in a slide operating in a vertical direction by means of a fine pitch screw. The final move is the tapping of the nose with a Murchey 3.8 inch, 14 thread, right hand collapsible tap. A sketch of the tool layout is shown in Fig. 5.

Preparing Shell for Socket

Following the boring operation, the interior is thoroughly cleaned by sandblasting to remove all traces of grease, and also prepare the surface for the application of a coating of shellac, which is applied just previous to the painting process. To insure accuracy in further machining operations and reduce to a minimum the possibility of eccentricity between the inside and outside diameters, the shells are recentered by placing on a special expanding mandrel held on the spindle of a lathe. The hole for the set-screw, which secures the steel socket, is then drilled and tapped, and the nose of the shell sized by means of a hand tap. The shell is now ready

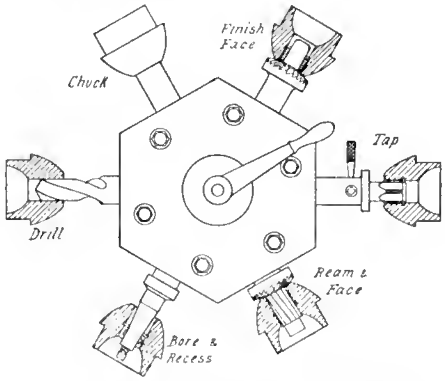


FIG. 7. TOOL LAYOUT FOR FINISHING SOCKET NOSE.

to receive the steel socket, which is finished in another section of the shop.

Machining the Steel Sockets

Before further operations on the shell can be proceeded with, it is necessary that the socket be placed in the nose, therefore, before describing the succeeding operations on the shell proper, it may be well to give a brief outline of the machining on the nose socket.

The first operation is boring and threading the nose to receive the fuse plug. A view of this operation is shown in Fig. 6, and the turret tool layout is illustrated in the sketch, Fig. 7. The cycle of operations is:—Chucking; rough drilling; bore and recess for tap clearance, ream and face, tap and finish face. The distance of the recess from the nose of the socket should be 1.2 inches, with a limit of 1/100 above or below. A variation of 5/1000 is allowed either way in the plain section of the bore on a neutral diameter of 1.895 inches. The diameter of the thread in

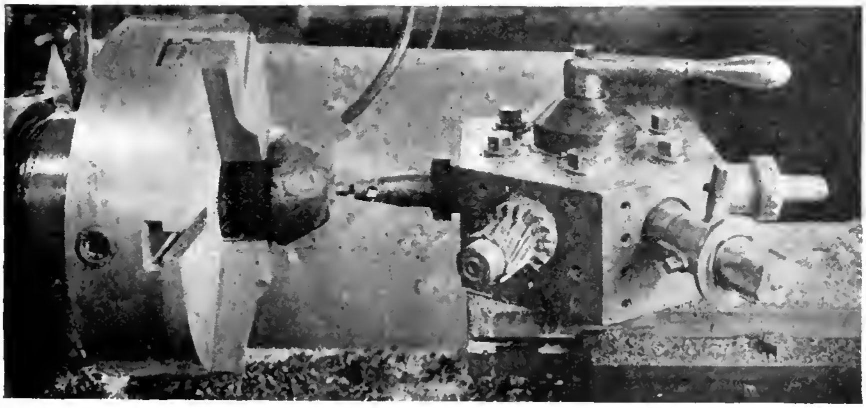


FIG. 6. MACHINING SOCKET NOSE ON BARDONS & OLIVER LATHE.

the nose of the socket is 2 inches, with an allowable limit either way of 3/1000; threads are 14 to the inch and right hand. Seven Bardons & Oliver single purpose single purpose unit handles on an average 450 sockets per day. On several occasions this has been increased to nearly 500. A 3.8 inch diameter, 14 thread Murchey collapsible die is used, the cutting dies requiring to be sharpened three or four times a day. Several sets are kept available, so that very little time elapses when dies are being replaced.

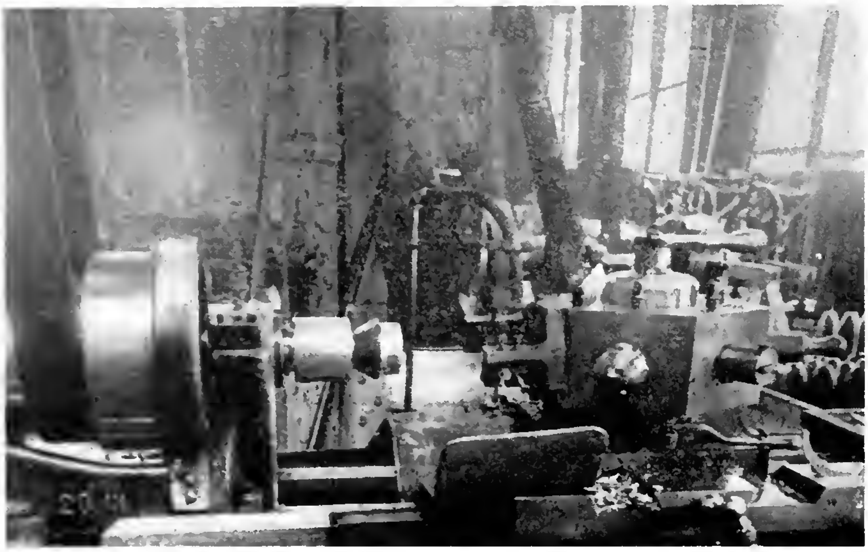


FIG. 8. TURNING AND CUPPING SOCKETS ON AMERICAN TOOL WORKS LATHE.

chucking lathes with Murchey collapsible tap are in operation, each with a capacity of 80 to 100 a day.

The socket is next removed from the chuck and placed on a threaded arbor secured to the spindle of a 20-inch American Tool Works Co. engine lathe. The various operations at this setting are:—Placing on arbor; turning the two diameters with two tools held in a special holder; facing shoulder and recessing for thread clearance; this is done with a small tool held in the rear extension of the special holder. Following this, the cup portion is cut out to a radius of 1.75 inches, while the end is faced off to a length from the shoulder of 1.55 inches, with a limit of 2/100 either way. The inner and outer edges are slightly rounded.

The next operation, that of threading the socket is performed separately on two machines; one of which, a Bullard

Finish Outside Diameter and Profile

The semi-finished sockets are screwed into the nose of the shell by gripping the body of the latter in a special chucking device secured to a floor stand. The socket is screwed in by means of a plug and three foot wrench. Following this, the shells are ready for finishing on the outside diameter and contour of the nose. A driving plug is screwed into the nose, the shell placed between the centres of an engine lathe, and is driven by the slotted chuck shown in Fig. 9. This sketch illustrates a simple and efficient arrangement for the completion of this operation. A series of rollers with a flexible cable in conjunction with a suitable cam are used to keep the cutting tool in the desired position. Upon the plate A, which is supported by two brackets extending out from the bed of the lathe, is secured the profile cam B. Instead of the cross feed screw being held in the saddle, it extends through and is held in the movable head C, which is free to travel in a direction at right angles to the lathe spindle, and is retained in proper alignment by the two studs D. The cable F, is secured at one end to the bracket G, and, after passing over the several rollers, is fastened to an eye-bolt in the weight L. When traveling on the parallel portion, the faces of the head C rest against the back edge of the saddle, and the depth of cut

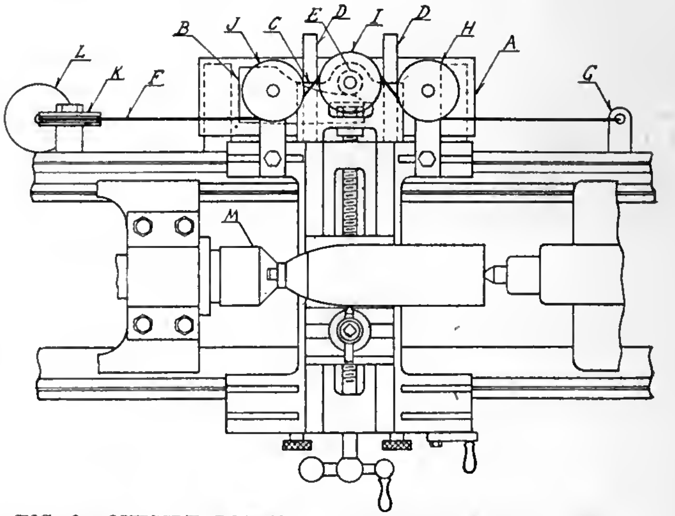


FIG. 9. OUTSIDE DIAMETER AND PROFILE TURNING ARRANGEMENT.

can be adjusted in the ordinary manner by means of the cross feed screw. When the tool is set in the proper position, the roller E will come in contact with the cam at the correct point, and, as the saddle advances, the profile of the nose is formed to the desired shape. About 24 lathes of American and Le Blond make are engaged on this operation, and each machine has an average of about 45 shells in 10 hours. The general run of tool steel is B-4, B-5, B-6 and Armstrong-Whitworth make.

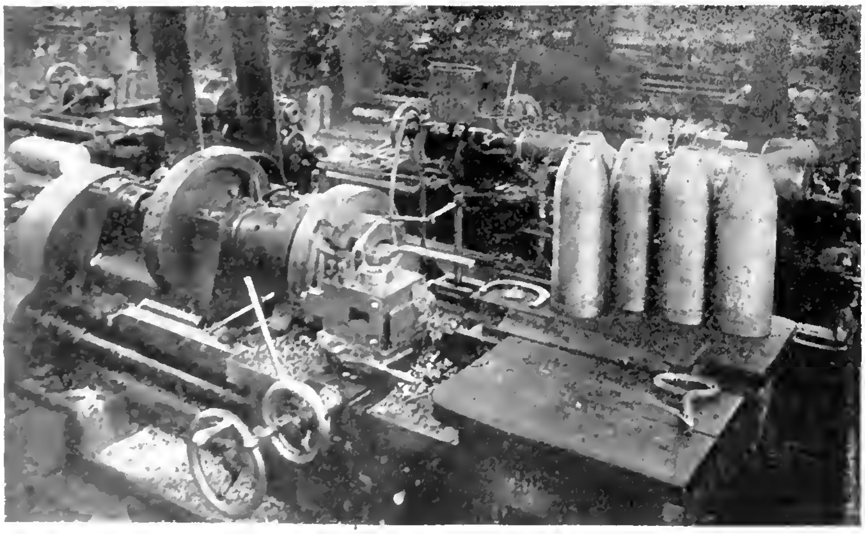


FIG. 10. GROOVING AND WAVING ON NORWOOD ENGINEERING CO. LATHE.

Facing to Weight

Following the finish turning operation, the shells are weighed, being usually found too heavy. The specified weight at this stage of production is 88.8 pounds. and the allowable variation must not ex-

FIG. 13. JENCKES MACHINES TURNING COPPER BANDS.

ceed 8 ounces above or below. In facing off the base to bring the shell to the required weight, an approximate estimate of stock removal is about 1/64 for each 2 ounces.

Grooving and Waving Operation

A view of this operation is shown in Fig. 10. Eight Norwood Engineering Co. lathes are employed, each with a capacity of about 200 shells in 24 hours. The tooling to produce the copper band groove is similar to that used on the

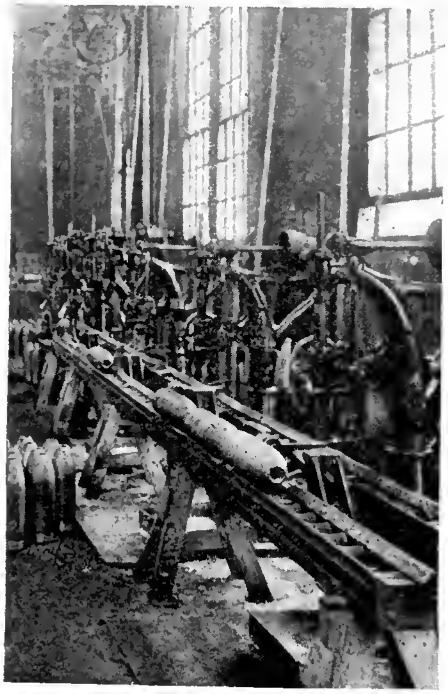


FIG. 11. DRILLING SCREW HOLES IN NOSE SOCKET AND SHELL.

smaller sized shells; that is, roughing, waving and undercutting. The latter is accomplished by means of two small tools held in a slide, secured to a holder and operated by a small eccentric. The cam is fastened to the face of the chuck and slots are provided for the free movement of the chuck jaws. Most of the chucking operations require an extension to the lathe spindle, and to insure sufficient rigidity, this addition is amply supported in a suitable steady-rest. To facilitate the handling of these 6-inch shells, all chucking operations are aided by specially constructed slides for placing the shells in, and removing them from the chucks. This device is shown in the right foreground of Fig. 10, and consists of a table placed over the bed of the lathe. In this table is placed the sliding block upon which the shell is placed. To increase the leverage of the cross feed handle, a one-half inch rod is used in holes previously drilled.

FIG. 14. GENERAL VIEW OF ASSEMBLING ROOM.

Boring and Recessing Base

As the base of all shells, during the firing from the gun barrel is subjected to enormous pressure set up by the rapid expansion of the propelling gases, it is essential that the metal there shall be of such a nature as to avoid any possibility of these gases penetrating to the explosive charge within the shell. For this reason it is deemed advisable, if not absolutely necessary, to remove a certain portion of the metal at the base (which is often found to have developed imperceptible defects, during the forging operations), and insert a steel disc, that will have its grain at right angle to the axis of the shell. The steel used in these plates must be free from laminations, flaws, cracks, surface or other defects and be uniform in structure. The dimensions of this disc for the 6-inch shell are a diameter of 4.5 inches, with a thickness of one-half inch. The recess for this plate is cut out in nine 20-inch American engine lathes, fitted with special turrets and three jaw universal chucks. The metal is first cut out with a broad nosed tool, bored to the desired diameter, faced and recesses for thread clearance.

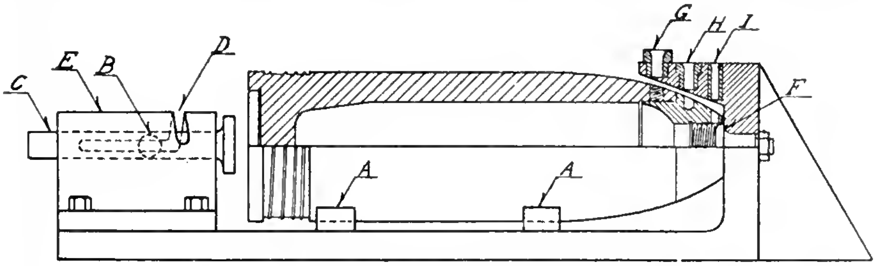


FIG. 12. JIG FOR DRILLING HOLES IN SHELL NOSE.

Drill Key and Set Screw Holes

The shells are now taken to a row of six drills—three Rego and three Cham-

pion Blower and Forge, where the holes for the key and the fuse set screw are drilled and tapped. These drills, as shown in Fig. 11, are fitted with special jigs and roller runways to facilitate the passage of the shells from one operation to another. The key hole for removing the socket has a diameter of .375 inch, and the fuse holder is a 1/4 grub screw. A sketch of the drill jig is shown in Fig. 12. The shell is placed on the two vee blocks A, and the handle B slid along the parallel slot. When the handle reaches the cam slot D, it is brought forward, thus forcing the head of the shaft C against the base of the shell, the shell in turn being moved forward to the proper position on the plug F. The three drill bushes are not all placed in the one jig, but are shown here in their relative position, as they would appear in their respective jigs.

Threading for Base Plate

The next operation is cutting the thread in the base. One Lees-Bradner and two Holden-Morgan thread milling machines are working continuously on this, each machine with a capacity of from 180 to 200 shells in ten hours. This thread, with a diameter of 4.5 inches, is 14 per inch, and is cut left hand. The purpose of the left hand thread is to counteract any tendency of releasing itself from its position when the shell is in flight. As the rifling of the gun barrel is right hand, the action of the rapidly revolving shell will consequently aid in keeping the base plate firmly in position. While this method of screwing the discs is now being employed, it will shortly be discarded and the riveted plate plan be adopted.

Applying and Finishing Base Plates

The base plates, which are punched from 7/8 plate, have a diameter in the rough of about 4 3/4 inches. To allow for holding in the chuck, the disc is recessed on one side to a depth of about 5/32 inch. They are held in a three-jaw chuck and faced and turned to the proper diameter and threaded. While the shell is held in a special floor chuck, the disc is screwed firmly into its place with a large pipe wrench. The surplus metal is then faced off to within about 1/16 of the shell base, the shell taken from the lathe and the plate thoroughly riveted by means of a pneumatic hammer. It is again placed in the lathe and the base turned off clean.

Press and Turn Copper Band

The copper bands, which are usually cut from tubing of suitable dimensions, are now driven over the end of the shell to a position in line with the groove. Previous to this, however, several nicks are cut across the waving ridges with a cold chisel, to allow the trapped air to escape when the band is being forced home. This is performed in a West banding press. Two or more applications of the pressure are required to complete the operation; the shell being slightly turned between each application.

Turning the copper bands to the desired dimensions is accomplished in three Jenckes band turning machines, two of these being shown in Fig. 13. The various operations for the completion of the band are practically the same as on the 4.5 shells, with the additional detail of undercutting a shoulder to a depth of .04 inch. This is performed by the small attachment placed on top of the ordinary cross slide and at the proper angle. The driving clutch and chuck are operated by compressed air, and each machine is equipped with a sliding block and table like that shown in Fig. 10.

Inspection and Assembly

The machining operations being finished, the shells are inspected and stamped on the base, assembled into series and passed along the bench for final weighing. The benches run the full length of the room, and, about midway, a space is provided where a large Toledo scale is placed, so that the shells can be conveniently rolled from their position on the bench to a suitable block situated in the centre of the scale table. The final weight should be 89 pounds, 3.5 ounces; with a limit of 2 ounces under and 7 ounces over. A general view of the assembling room is shown in Fig. 14.

Cleaning and Painting

The shells are thoroughly cleaned and shellaced on the inner surface. Particular care is required in this operation, so as to have a clean, smooth and well covered surface, as the chemical action of the explosive charge has a very deteriorating effect upon any uncovered portion. After the cap and set screws have been inserted, the shells are given a coat of good paint to protect the surface from the action of the corroding elements in transit or otherwise.

A NEW HIGH-SPEED TOOL STEEL

AN alloy which contains neither tungsten, molybdenum, nor cobalt, and which is claimed to give excellent high-speed tool-cutting quality, has recently been produced by Darwin & Milner, of Sheffield, England. They gave a demonstration at their works, during which the casting of the bars was witnessed. The steel, which is melted in an ordinary crucible furnace capable of yielding high temperatures, is run into either metal or sand moulds and cast to the form desired. When cool, and without any forging or heat treatment, the tools produced are ground on an emery-wheel (dry) and finished on a wet grindstone. They are then ready for immediate use. From this it will be seen there are no complicated forging and heat-treatment processes to go through, and as the tools obtained possess the correct hardness, a number of skilled operations are eliminated.

Makers' Tests

The tools cast were 1 1/4 in. square, but other sizes were exhibited, and some of them were seen in operation. The firm state that they are prepared to cast bars of any shape which are at present in use up to 4 in. square. They have tested the new alloy steel for cutting properties on high tensile steels, commercial steels, cast iron, and phosphor-bronze, and claim that it is equal in cutting properties to any high-speed tool steel on the market, but they have not yet carried out any exhaustive endurance trials, nor have they arranged for any independent trials, therefore the behavior of the steel in bulk supply is to some extent unknown. The following trials run on some tools made by the firm serve to indicate the results which may be expected. The test-piece on which the tools were operating was a chrome-nickel forging of the following composition:—Carbon, 0.32 per cent.; silicon, 0.07 per cent.; manganese, 0.59 per cent.; chromium, 1.26 per cent.; and nickel 3.28 per cent.

A 1 1/4 in. new alloy high-speed tool when used as a turning tool on the above forging at a surface speed of 120 ft. per minute; depth of cut, 3-32 in.; and feed, 1-32 in.; ran for 7 minutes before it broke down, while a tool made from a well-known brand of high-speed tool steel lasted, under the same conditions, for about 2 1/2 minutes.

A 1/2 in. square new alloy high-speed tool was run for some time with a feed of 1-32 in. and a surface speed of 55 ft. per minute; the speed was then increased to 112 ft. per minute, and later on to 120 ft. per minute. The tool stood this test satisfactorily, and was good for further service.

The new alloy tool used in the first test was ground up on the Gisholt grinder (dry), finished off on a wet gritstone, and then without any heat or other treatment was used in the lathe on turning the test forging with good results. The firm state that they will be putting the new alloy steel on the market in a few weeks.

Toolmaking Specialization.—In a paper read before the Keighley Association of Engineers, John Judson complained of the absence of specialization among the local tool makers. He pointed out that tool making was the basis of all other engineering manufactures. We needed more of the American readiness to scrap obsolete machines, and of the spirit of development. All the Keighley firms ought to get together for round-table talks, imitating in this respect the example set by Germany and America.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

CONCRETE FOUNDATIONS

By A. L. Haas

BEFORE an engine or planing machine can be set to work or indeed any machine at all, it is obvious that some preparation of mother earth is necessary. The universal material for this purpose is concrete, which has the double advantage of low cost and durability added to which the material is worked in a plastic state and so can be made to assume almost any shape at will.

Ferro-concrete construction is the province of the specialist, but most engineers at some time or other need to utilize concrete and few understand the brief essentials of success. The local builder or handy man working by pure rule of thumb, does not as a rule prove successful, as witness the gaping cracks and poor work too often in evidence. Playing with concrete is quite a fascinating pastime to one versed in usual engineering materials, its plasticity and endurable nature are alike surprising to the metal worker. In the case of foundations which the average erector is called upon to deal with, there exists no sacrosanct mystery about the art which demands any considerable tuition.

Essentials of Concrete

Concrete consists of three dry essentials, aggregate, sand and cement, while the fourth ingredient is plain water. For the purpose indicated the aggregate should be clean gravel or broken stone. It should be uniform in size; this to some extent depends upon the size of the foundation from ¾ in. cube up to 2 in. cube, or a mixture of both in due proportions can be considered suitable. Sand should be clean, sharp when felt between the fingers, and washed to free it from small particles and any earthy matter. Cement should be of an approved brand artificially made, and from a manufacturer of repute. Water should be free from either acid or alkali.

Well made conrete consists of a packed mass of aggregate, the interstices between filled with sand, the voids between the grains of sand filled with cement. A film of cement, coating and separating the other materials and filling the minute voids between, forming the bond only.

Cement one part and sand two parts is the usual mixture adopted. To find the amount of this mortar with any local aggregate is easy. Fill a vessel of known capacity with aggregate (a 3-gal. bucket will do), pour in water from another can of known capacity until water is just level with aggregate. The quantity of water (volume) so found is the needed amount of 1.2 mixture. Taking a recent instance where 1½ gallons of water filled the voids, this represents 3 gallons aggregate and 1½ gallons of 1.2 mixture or 4 parts aggregate, 2 parts sand and 1 part cement. To be perfectly safe, 10 per cent. may be added to the sand cement mixture, and it must be remembered that the volume of the resultant concrete is that of the aggregate only. (There is a 5 per cent. increase which, however, may be neglected.) The figures are arrived at as follows:

6 parts aggregate, 3 parts mixture.
6 parts aggregate, 3 sand, 1½ cement.
12, 6, 3 = 4, 2, 1.

Results Desired

The object sought is least volume of cement for equal strength, increase in sand and cement does not add to strength, for this reason a little experimenting with the aggregate and a water can, will save the most expensive ingredient—cement.

Where say 2 in. and ½ in., or ¾ in. aggregates are to be used in combination, mixing these in varying proportions to see how they pack is worth while. It must always be remembered that complete filling of the voids in the larger material is the end sought.

Since the strength of the finished work depends entirely upon the due incorporation of ingredients, the quantities of each must be measured for each mixing. A simple square box, minus top or bottom, is at once the simplest and most effective method of gauging. Four level fillings with aggregate and then two of sand followed by one of cement gives the exact proportions. Having the area of the foundation and the thickness, the volume gives the amount of aggregate (invariably supplied by the cubic yard) while cement and sand in proportion need leave neither over plus nor insufficiency for the job.

The nature of the subsoil determines the thickness of the bed, where this is made land, it is always safe to double the erection plan instructions

The ingredients having been duly measured, the heap should then be thoroughly spade-mixed dry; twice turning is usual practice. The proportion of water needed is from 21 to 24 gallons per yard cube. The water (measured) is best applied with a rose-spout can, while the shovels turn the mass over.

The mass as soon as mixed is dumped in the excavation; rough board forms serve to contain it where the foundation is to be above floor level when finished. Tamping or ramming the wet mixture is desirable to ensure solidity and absence of voids in the finished job.

Regarding Reinforcement

Where the sub-soil is poor or where the foundation will be subject to heavy vibration, a reinforcement of plain steel bar at ¼ thickness from bottom (tension side) is advisable. Concrete is strong in compression and weak in tension; all reinforced work is designed with this in view. In the case of foundations of the character under discussion and made by the average erector, there is little danger of the reinforcement being too weak.

Another point not so well understood is that large fissures and cracks will not develop where rod is incorporated, the resultant cracking being then invisible to the naked eye. For this purpose the proportion of metal need only be small and expanded metal laid a few inches from surface obviates all danger from surface cracking.

Where a good exterior finish is needed the portions visible should be finished (rendered) for the last inch with a mixture of one-part sand, one-part cement worked to a surface with a wood float. This should be done subsequent to the placing of the job. The proportions of 1-1 gives a watertight coat, according to one leading authority.

Avoid Excessive Water

For the reason that the wettest concrete contracts the most, the least quantity of water to give a uniform plastic mass is to be desired. Temperature and weather conditions hasten or retard the setting and hardening of the concrete; frost indeed retards it almost entirely, and is liable to spoil the job.

As soon as the surface will not indent with the finger, it should be sprinkled and kept wet until the last moment. The chemical action which takes place does not cease for a long period, and depends upon an occasional drink.

Concrete strength increases with age, and does not attain its maximum for two years; it is about half strength at 28 days, so that the latter time should be allowed before mounting a heavy machine. If foundation plans are finished in advance, the time for setting does not usually result in serious delay. The difficulty as to the location of foundation bolts can be met by allowing square

chases for the bolts and filling these in when the job is at site.

Foundation Plans Inaccurate

It is a surprising fact, but none the less a true statement, that few foundation plans are accurate enough to locate holding down bolts in a concrete bed before arrival of job. Any outside erector of experience can corroborate the statement. Why this should be so is a mystery, seeing that bolt holes of this character are usually over-size.

The usual procedure, the foundation having already been prepared, is to level up the job on packing and then using a mixture of 1:1 cement and sand point in the entire under framing and bolts. The mixture should be rammed thoroughly in with board ends or sticks. Such a mixture sets quickly, especially seeing that it is of no great mass. This final grouting may also serve to permanently locate the job by bushing the mixture up to the top edge of bottom flange of framing.

It is frequently stated that the bed of a job should carry the weight of the superstructure without aid from exterior foundations. Until every maker adopts this counsel of perfection, it is certain that oil engines, compressors and most planing machines benefit from a due regard both to mass of foundation and the support rendered thereby. Even where the bed of the machine is heavy, the provision of a foundation platform is always desirable.

In the case of drop stamping plants, where the stresses are not self-contained in the framing of the plant, six or eight feet of concrete of adequate area serves to earn its keep by the absorption of the shock set up. Steam hammer foundations are another story; a resilient under-structure is needed to absorb the vibration; while the stresses are taken in the framing itself, the resiliency of the foundation minimizes the shock and renders the framing less liable to fracture.

Necessity for Re-alignment

Regarding planing machines and similar machine tools, where re-alignment from time to time is necessary, this can be provided in a variety of ways by folding wedge devices located in the concrete. At the same time, the stability of the machine and need for adjustment depend greatly upon the solidity afforded by the concrete underneath. It is thought that if due care were exercised both in the mass and composition of the concrete re-alignment, which gets scant attention in the average shop, would be less required and longer intervals might be left between such periodical attentions.

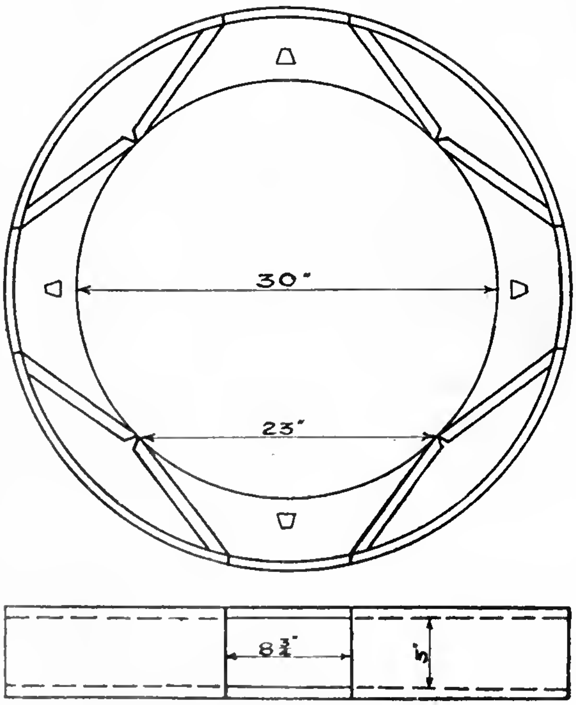
The facts in this article are in absolute agreement with the leading authorities on the subject, and none are disputed points. If this leads to better understanding and practice in the matter of laying concrete foundations, such as fall from time to time to the engineer and works manager, the purpose of the article will be served.

THE BOILER SHELL CUPOLA

By Jas. R. Tate

THE most successful cupola man I have yet worked with, was a man who loved his cupola. I fancy I hear and see him now. Never excited, always patient, and evidently knowing the cause of every little turn the iron took, during the heat. There was not anything peculiar about him, even his talking to the cupola. We all felt that it was the natural thing to hear John saying, "Steady, steady now," when the iron was coming rather quickly for us. Perhaps you have talked to your horse or your dog. What is there to the trooper who does not love and talk to his horse? What is there to the musician who does not love his instrument? It is a most natural condition. It is a true fingerpost to successful service, and one, without which, no man has ever been truly successful.

It is equally true with we foundrymen. We recognize the cupola as the very heart of our foundry, whether it be one with all the latest fads on it, or be just an old, homely-looking boiler shell affair, makes little difference. It is our cupola and of course we do not want anybody picking holes in it. Well, I am not going to find fault with yours at all. I know it is a good one or you would not have it. Why, of course not, but I am supposing that you just think so much of it that you would like to help the old friend a little. Help her to melt iron more easily and with less effort—help her to win more praise for herself as a good melter, etc.



THE BOILER SHELL CUPOLA

Taking this stand, we will figure it out as to whether or not you have been expecting too much from this old boiler shell cupola. In the first place. How much iron should you really expect to melt per heat? Conditions being right it is possible for you to melt "properly" about 9 lbs. of iron per hour, to every square inch there is in the area of your cupola; for instance, if your cupola is 30 in. diameter inside after bricking up, then it is possible to melt 6,354 lbs. of iron per hour, in such a cupola, providing other conditions are correct. The capacity of any cupola can be figured out in the same way as this one has been figured: Diameter of cupola 30 in. $30 \times 30 = 900$. $900 \times .7854 = 706$. $706 \times 9 = 6{,}354$ lbs. per hour.

Correct Amount of Air

Special attention must be given to the fan or blowers required, and tuyers—they are the main requirements and must be correctly proportioned to get the best results out of any cupola. There is more taking for granted, and hit and miss about the air that is required to melt properly, than anything else in a foundry. Giving our wives credit, on the side, I do believe they know more about the drafts in their cook stoves, than some of us know about the drafts in our cupolas—at least taking it turn for turn, good pies, poor pies, good heats, poor heats. It looks that way, only we are too conceited to admit it. But, after spending much money to find out, we have learned that there is a correct amount of air required to melt iron properly. To melt one ton of iron in one hour requires 30,000 cubic feet of air. So if your cupola has a capacity of three tons per hour, it would require 90,000 cubic feet of air to complete the combustion necessary to melt this amount of iron. The 30 in. cupola mentioned would require about 95,000 cubic feet of air per hour. Therefore, without going into further detail, get a catalogue of your fan or blower and see if it is big enough or too big, running too fast or too slow, to supply the air required to give your cupola a fair chance.

The next, and equally as important condition to consider is how to deliver this air. When you want to fill a pail with water from your garden hose, you do not turn the nozzle as you would do to throw the water on the roof. Why don't you? You simply want the water dropped into the pail. You don't want

it splashing around in every direction, do you? Well that is just what many of us are doing with our cupolas, only we are paying good and proper for it. We are delivering the air into the cupola under such a high pressure that it is cutting up all kinds of antics with the lining, the iron, the coke and the melting. Then we get ill-tempered and blame everything in sight and bang and hammer around hoping to hit something right somewhere, sometime. The fact is this, to melt successfully, the air must have room to get into the cupola, and all it wants to do is to get in there. It does not require forcing in at such a great rate. There is a rule which has been found to be correct. Taking this 30 in. cupola with an area of 706 square inches, the total amount of tuyer area must be one-quarter of this cupola's area, thus $706 \div 4 = 176\frac{1}{2}$, or in other words the total tuyer area should be 176 sq. in. If you are going to have 4 tuyers, then divide the 176 by 4 which gives 44 sq. in. to each tuyer. This would require an opening of about 5 x $8\frac{3}{4}$ at the small end of each tuyer, or at the end which is next to the shell.

The tuyers should now be widened out enough to make a complete tuyer running around the inside of the cupola. The circumference of a 30 in. cupola will be about 94 in. Dividing this up into four equal parts, will give $23\frac{1}{2}$ in., thus each tuyer iron will be 23 in. wide at the larger end and have an $8\frac{3}{4}$ opening at the smaller end. The tuyers of other size cupolas can be figured out by this same rule. If 5 tuyers are to be used, it is simply a matter of dividing up the quarter of the total cupola area into 5 parts, as we have here divided it for a 4-tuyer cupola.

Locating Tuyers Vertically

In cut you will notice there are posts set into tuyers. Their only duty is to stop coke from pushing into the tuyers. Under the mentioned conditions, a cupola will be supplied with oxygen in volume and not under pressure, giving in return perfect combustion and good iron.

As for the height tuyers should be from sand bottom, that is a matter controlled by the nature of your work. Certainly the lower the tuyers are placed, the less coke is used up in building a bed, which must reach the melting zone. For the ordinary jobbing shops, 12 in. from the sand bed to the lower edge of tuyers, I have found to be the most serviceable, but should your work be of a light nature, 9 in. is plenty. It will save you much coke and give you just as good iron as would be given with the tuyers 19 in. from bed.

I do not like the word "blast" in cupola practice, it is misleading. We do not want a blast, we want the air, and what the air contains. Many and varied are the methods of conducting air from fan to cupola, but with this variation I have learned, that to cause friction, by having small pipes, many elbows and sharp turns, is detrimental to the melting qualities of any cupola. In fact the only way to give your fan and cupola a fair chance, is to have the air pipe larger than the opening at the fan. Have it two inches larger in diameter at least, and do away with as many elbows as possible. I use the words air-pipe. I hope you will think of it as such. You don't want air squirted into you under pressure, do you? Well, the cupola is just as human as you are in that respect. It just wants the oxygen in volume, but not to be crammed full like a ballon.

Provide Gates on the Air Pipe

Gates on the air pipes are good things and pay for themselves in a short time. It will naturally take less air to melt the iron at the latter part of the heat, and with a little practice, the use of these gates will become an important part of your cupola practice. It is also essential that these gates should be on the air pipes, for we often hear of an explosion having occurred in some foundry, caused by gas backing up into the air pipes when the fan was stopped. With the gates it is an easy matter to close them, and thus avoid such an accident, at such times as the fan is stopped during a heat.

The height of charging is often governed by the style of building the cupola is placed in. This is, in some cases, apparently justifiable, but if we are to get the very best out of every dollar we spend in our foundry, it will pay us to have this part as near right as some of the other more active portions. Taking this 30 in. cupola again, suppose the charging door is 60 in. from bed plate, our tuyers are 12 in. above bed, causing the melting zone to be about 30 in. above the bed plate. Here we have only 30 in. left for charging. Does it not seem reasonable that the iron last charged in this cupola, will reach the melting zone at a cooler temperature, than a cupola of the same proportions, charged to the door which is 120 in. above the bed plate? The point is, that we are getting more value out of the coke burned in the latter cupola, and are helping the cupola to melt iron more easily and quickly by depositing the iron in the melting zone heated to a higher temperature. Certainly, in the large sized cupolas this is hardly practical, as the height would be too great, but in the smaller sizes, say up to 54 in. cupola, it is well to keep the charging door three or four times as high, from the bed plate as the cupola is in diameter.

INCREASED PRODUCTION BY CO-OPERATIVE EFFORT

By J. R. Hamilton.

WITH the demand for increased production, particularly for a short period, it is customary to operate the plant for a sufficient number of hours "overtime," by the ordinary day staff. This method, however, of increasing the output, while fairly successful temporarily, has been found unsatisfactory if extended unduly. The workmen, in anticipation of receiving a little extra remuneration, will for the first few nights or so be quite able to meet the extra demand made upon their normal store of energy, but as time goes on, the apparent novelty of the thing begins to wear off. They become weak and languid from the long hours, lack of interest and enthusiasm develops, and in many instances men will be found at work during the "overtime" hours and be missing altogether on one or two mornings each week. Under the above conditions production will increase only while the men are still physically fit. It will therefore, be found that very little is to be gained by having them continuously at work for fifteen or eighteen hours a day after the first week or two.

Two and Three-Shift Systems

When the demand for product reaches the stage that longer plant operation becomes absolutely necessary—for example the manufacture of shells — then no other course seems open but the organization of a night shift. During the initial stages of the present shell-making activity, many factories tried out the extra or overtime system, but increasing demands made it imperative that the machine equipment be kept operating at full capacity for almost the entire 24 hours per day. While the system in vogue in many of the large shell forging plants is that of operating three shifts of eight hours each; the general practice adopted in the machining of the shells is to have two shifts only, one during the day and the other at night. To successfully accomplish this, however, requires careful and tactful consideration on the part of the plant superintendent and shop foremen. It is advisable to secure sufficient first-class workmen for the night shift to maintain an even balance with those operating the same machines during the day, but it is often exceedingly difficult to obtain and hold good men for night work. Skilled workmen, capable of holding responsible positions, prefer to work in the day, and unless some concessions are made for night work, the possibilities are that the night staff as a whole—will be inferior to that employed during the day.

Many disadvantages arise from working at night. Loss of regular sleep: improper nourishment: insufficient and

improper shop lighting; all help to break down the constitution of the average workman. However, in times like the present, when everyone is working at high tension, these, as well as many other objections, pass into the background to make room for the one essential factor—the production of shells to the full capacity of the plant and also every individual workman.

Day and Night Operator Traits

Two of the chief factors entering into the ultimate output of a certain machine, operating day and night, are the individual traits and working methods of the day and night operator. In a great number of cases these two men never see each other, with the result that little co-operation takes place between them. When one stops to consider that there are all classes of men operating shell machinery, the range of mechanical ability between two workmen may, and very often does, vary to a marked degree. I was told by an operator, a short time ago, that he spent from thirty minutes to an hour every morning, sharpening tools and putting things in shape before he could get started. He said he could not see how the night man did the work with such tools. One might say that this particular man was a little fussy, or had an exaggerated opinion of his own ability; but the fact remains that his record was about ten per cent. higher than that of the night operator for the same period of time.

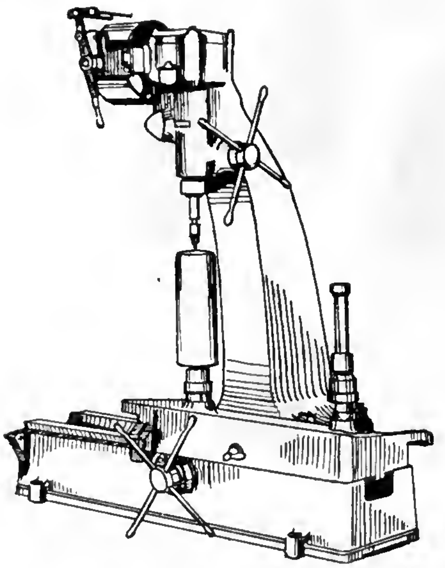
In direct contrast to this case was another in the same shop, where two brothers were operating the same machine, one during the day and the other at night. It appears that these two brothers had made a careful study of all the details of operation; handling of the work, sharpening and setting of the tools, special location for all auxiliary equipment, etc., so that, as each one came to his work at night or in the morning he was familiar with conditions prevailing during the previous shift. Each one advised the other of any developments during his period; such as, the particular nature of the steel being worked, breakages or replacing of cutting tools, transmission troubles, etc., in fact each man was so informed that it was as if either was operating the machine continuously. As a result the output from this one machine was greater than that of any other, working on a similar operation.

From this it would appear that to operate machinery day and night, it is quite advisable to have some understanding between the men of each shift, so that by mutual co-operation, and adjustment of individual ability, petty barriers of personal prejudice may be broken down, and a force created that cannot fail to achieve remarkable results.

SHELL-CENTERING MACHINE

THE accompanying sketch shows a shell-centering machine as supplied to British munition makers by William Asquith , Ltd., Halifax, Yorkshire. The essential features of the machine are of the simplest possible description, no superfluous detail having received any consideration whatever. The sliding work table is gibbed to ways on the top of the bed, and is provided with two vertical work arbors carrying suitably arranged conical bushings which automatically centre the shell forging.

By means of the cross-handle in front operating a rack and pinion, the table is moved to either side so as to bring each arbor alternately under the spindle. Stops are provided for accurately adjusting the position of the arbors. The spindle has a down feed of 4 in. through cross-handle at side, its speed being 480 revs. per min. It runs in ball bearings, and has a ball thrust bearing for the thrust.



CENTERING MACHINE FOR LARGE SHELLS.

Tight and loose pulleys are mounted on the upper part of the column, dispensing with a countershaft and keeping the belt clear of all possible contact with the operator. A special scribing attachment can be fitted to indicate whether the forging is within the limits of concentricity required for machining purposes.

THROUGH BILLS OF LADING

THE term "through bill of lading," means a bill of lading from the port of shipment to destination. It may happen however, that unless a sufficient quantity of freight is offered for some of the less important places, a "through bill of lading" will not be issued by every sailing. The steamship companies can usually advise in such cases, whether it is desirable to ship to the nearest point for which a "through bill of lading" is issued or as to the probable date when shipment can be made direct on a "through bill of lading" to destination.

ALTERNATING CURRENT DRIVING IN FACTORIES

INFORMATION of value to those who contemplate driving workshops with alternating-current motors was given in a paper read before the Junior Institution of Engineers by G. H. Ayres. As regards the electrical operation of cranes, it was pointed out that there are three types of motors that may be used, direct-current series motors, alternating-current slip-ring motors, and alternating-current squirrel-cage motors. The direct-current series machine is undoubtedly the best for crane driving, but its use is, of course, prohibited where the supply is an alternating one. The next best machine is the slip-ring motor. In the opinion of the author, however, the squirrel-cage machine will, if properly designed, answer the purpose quite well, and offers the advantage that only half the number of trolley wires required by a slipping motor are needed, which arises from the fact that no separate control is necessary for the rotor circuit.

Under the heading of fans, Mr. Ayres said that from the efficiency point of view, the slip-ring motor appears at first sight unfavorably at reduced speeds, but as the output of a fan varies directly as the cube of the speed, it will be found on plotting a curve showing the relation of speed to energy dissipated in the rotor, to reduce the speed, that the wastage is not so formidable as it seems. Large machine tools, it is pointed out, occasionally call for speed variation.

The author considers that in these cases it is usually advisable to employ a squirrel-cage constant-speed motor, and to drive through a countershaft by means of stepped pulleys or else by some form of gradual-change speed gear, such as Reeves' gear. Slip-ring motors with resistance in the rotor circuit are quite unsuitable on account of the poor speed regulation, the speed varying appreciably with every change of torque. Suppose, says the author, in a large lathe or planing machine, that a cut is being taken over a broken surface, such as the underside of a bed-plate, and the controller is set to give half speed with full-load torque, then between the cuts the motor will speed up considerably and the tool will strike the metal on the next portion of the cut at a damaging speed.

Multi-Speed Motors

Where a change-speed countershaft is impracticable, a special multi-speed motor designed for pole-changing may be employed. Suppose two speeds are required, with a ratio of 2 to 1. The stator would be wound with a single winding as in a normal machine, but arranged so

that by means of a simple throw-over switch the number of poles is altered and high and low speeds obtained as required. Such motors can be made for the same output at both speeds or to give at the top speed twice or three times the output given at the low speed. As regards cost, however, this machine would naturally be rather expensive. When two speeds are required with a ratio other than 2 to 1, or if four speeds are required, the motor must have two separate stator windings. The majority of multi-speed motors are constructed as squirrel-cage machines, but it is possible to build them with wound rotors.

Accumulator Controlled Pump Drives

These multi-speed motors are ideal for driving hydraulic pumps. The speed changes are made by a controller operated by the travel of the accumulator, and the switching arrangements are considerably cheaper than is the case where direct current motors are used. An interesting example of such an installation is to be found in a large railway works. Three motors are designed to give synchronous speeds of 333, 500 and 1,000 revolutions per minute respectively, with corresponding outputs of 30, 45 and 90 horse-power. Each motor has two stator windings—one for 18 poles and one for 12 poles—and by reversing half the latter winding a 6-pole field is produced.

Under the heading of peak loads come power presses, punching and shearing machines, and other similar machines, which usually do heavy work during only a small portion of the operating cycle. Most machines of this kind are fitted with fly-wheels to overcome the peak load. There are two possibilities which make the fly-wheel of little or no value. Either the capacity of the motor may of itself be insufficient to overcome the peak or the characteristics of the motor such that there is insufficient drop in speed to permit the fly-wheel to give up the energy stored in it, which is apt to throw considerable overload on the motor.

When the greater part of a workshop is driven from line shafting and the machines are provided with fast and loose pulleys, the adoption of alternating current in a factory having its own plant is very convenient and economical, as a squirrel-cage motor can be left permanently connected to the generator and will run up to speed with the generator without taking excessive current. An exciter rather larger than usual is necessary, but the method of starting is, in the opinion of the author, an excellent one. When single-phase current is supplied to a factory the Arno-Ferraris starting system is advocated.

The Generating Plant

The generating plant should consist of two steam turbine-driven alternators, each having a capacity of two-thirds of the aggregate horse-power of the works motor equipment. Normally one of the sets stands idle, but may be used to take up load and help the other set when the works are busy. The turbines, generators and switchboard should be erected on the ground floor and the condenser in the basement. Also, there would be mounted in the basement a high-speed vertical steam engine, connected through a clutch to the air and circulating pumps. These would also be coupled to a three-phase squirrel-cage motor, so that they could be run from the main generator supply. This motor should be of sufficient capacity to drive the pumps at one end of the shaft and the exciter at the other end, the exciter being of sufficient capacity to deal with the lighting when worked by the engine at times when the main sets are shut down. The method of starting up the plant would be as follows:

First the small engine is started with the clutch in, so as to drive the pumps and exciter. The vacuum and exciter volts are so obtained. Next the turbine would be run up to speed, and as voltage and periodicity increase, the main line shaft moters in the works run up to speed simultaneously. Full voltage having been obtained, the pump motor would be switched into circuit and the engine de-clutched and shut down.

Departmental Arrangements

Most machines in pattern shops must stand well into the middle of the space available on account of the size of the pieces of wood to be passed through them, and, further, on account of the fact that the patternmakers' benches are placed round the walls under the direct window light. As the motors, usually ranging from 5 to 25 horse-power, and start light, squirrel-cage machines with star-delta starters may be used. A duct should be placed under the floor, to extend from side to side of the room and open to the atmosphere outside the building. Pipe-ventilated motors drawing air from this duct and discharging the air through gauze into the room are the most suitable for pattern shops.

In the foundry a short length of shafting can be used for driving rumblers, grinders, saws, and the sand blast. This length of shafting may be driven by an open protected-type squirrel-cage motor started with the turbo-generators. As the atmosphere of a foundry is charged with dust, this motor must be cleaned by blowing it with a pair of bellows at least once a week. Cupola blowers should be driven by slip-ring motors, with a regulating resistance in the rotor circuit.

An economical arrangement for machine shops is to have two large main bays separated by a narrower small bay. On the division stanchions between each large bay and the small bay would be a line shaft, making possible the provision of four lines of machines—lathes, capstans, turrets and millers. On the outer side of the main bays would be the large lathes, planers, etc., requiring individual drives. The line shafting would be split up into lengths, requiring motors of from 30 to 50 horse-power. It should be possible to couple or isolate these lengths of shafting by means of clutches. The motors should be close to the shafting and should drive through silent chains running in oil baths. As the motors start up with the turbines only emergency starters will be required, and the handles of these starters should be fixed in the "on" position by means of padlocks. Above the small bay would be a gallery for light machines or for the assembly of detail work.

Various Practical Application

Blowers and exhausters in the smiths' shop may be driven by high-speed squirrel-cage motors with star-delta starters. Drop hammers, shears, and angle choppers may be driven by high slip squirrel-cage motors and a simple switch; coupling the stator windings directly to the mains will suffice, the torque being ample to accelerate the fly-wheel in reasonable time. Cranes erected over main and small machine bays and also in foundries may be driven by squirrel-cage motors with high-resistance rotors. There should not, however, be any mechanical or soldered contacts in the rotor circuits. All joints must be welded or cast solid. Tramway type reversing controllers may be used for inserting and cutting out resistance in slip-ring rotor circuits, and the longitudinal and cross traverse controllers should be geared together and operated from one handle, so that the movement of the controlling handle is in the direction of the motion required.

The author assumes that the plant is laid out in accordance with the modern plan of receiving goods at one end and shipping them at the other end of the main aisles. Under these conditions there will be in the receiving stores a capstan for wagon haulage, and this capstan will be worked by a two-speed squirrel-cage motor. The controller would consist of two pedals giving high and low speeds and having a spring return arrangement for returning the controller to the "off" position.

Hydraulic lifts, presses, etc., would be supplied by three-throw pumps and an accumulator, and the pumps would be driven by multi-speed motors, as already described. The advantage of the multi-speed motor over the stop-and-start system is that it runs for longer periods at one speed, and thus saves the continual breaking of the circuit. The compressor for supplying compressed air to pneumatic tools and for brazing and soldering must, on account of the heavy torque needed, be driven by a slip-ring motor.

Canadian Manufacturers' Association Convention

The accompanying abstract of the proceedings of the recent Canadian Manufacturers' Association Convention will serve to indicate that those responsible for the adminstration of our varied industrial enterprises are fully alive to the pressing needs of the hour as well as to committment without delay to a scheme of co-operative effort which will enable them to meet successfully post-bellum trade conditions as far as these can at the moment be anticipated.

THE 42nd annual convention of the Canadian Manufacturers' Association opened in the Royal Connaught Hotel Hamilton,, Ont., on June 13, and occupied three days. The unusual conditions prevailing in the Dominion, owing to the war and the general effect on business, lent additional interest to this year's meeting. The proceedings were opened with the reading of the annual report by the secretary, G. M. Murray. The report showed that the association had accumulated a surplus of $4,922.50 during the year, and had now a reserve of $50,168.49. Reference was made to the depletion of the staff owing to the war. Col. Poussette, the Western secretary, went overseas with the second contingent; Capt. McIntosh, the Toronto secretary, enlisted with the 70th Battalion; Major Stirrett, editor of Industrial Canada, was with the 126th Battalion; Mr. Meldrum, the Montreal secretary, was taken by the war department of the C. P. R. and sent to London; his successor, Mr. Campbell, is now in France with the Trade Commission; Mr. Scully also left for military service.

President's Address.

President J. H. Sherrard, in his address, reviewed the military situation and the events in the economic field in Canada during the past year. He spoke of the splendid response of farmers and manufacturers to the call for increased production and its effect upon the prosperity of the country. "Our farmers are prosperous," he said; "our workmen are profitably employed; our mills are busy." The making of munitions, said Mr. Sherrard, had not only brought a considerable degree of prosperity to Canada, but it had also improved the efficiency of workmen and manufacturers, and advertised Canada as a country capable of producing something besides wheat, apples and lumber.

Registration

He alluded to the difficulty manufacturers and farmers alike were now experiencing in securing labor, a situation in striking contrast to that of a year or so ago, when manufacturers were devising means to find work for the unemployed. He pointed out that while it was essential that Canada should furnish soldiers to defeat the enemy, it was equally essential that she should feed and clothe them and supply them with ammunition.

In England, where the women had rendered splendid service by taking the places of men, conscription had been found necessary in order that every man's service could become effective. Therefore, he asked, "has the time not come for Canada to register her men, so that those who can be most useful to the war by remaining at the work they are necessary to shall not be recruited, and so that the remaining available men will be induced to do their duty by enlisting? We have already lost much ground that we might have occupied because we have refused to even whisper conscription. Can we longer afford to drift along with closed eyes?"

Trade After the War

Next to the prosecution of the war, continued Mr. Sherrard, the question of trade after the war was perhaps the most important subject which could engage the people of the allied nations. It was known that the warehouses of Germany were bulging with manufactured goods accumulated during the war for the purpose of again flooding the world's markets. The Allies were now studying how they could protect their markets from the threatened invasion and develop trade with one another. Great Britain was also studying how she could develop inter-Empire trade, and there were indications that she would abandon the principle of free trade. Would she, however, give her Overseas Dominions a preference on foodstuffs and would she require concessions in return?

President Sherrard pointed out that Canada had long granted British manufactured goods a tariff preference in her markets. He argued that a preference for Canadian foodstuffs in the British market would not increase the cost of the loaf there and would be of great benefit to the Dominion. He insisted that Canada should be wise enough to prepare now for the time when orders for munitions and war supplies would be cut off.

Industrial Mobilization

"We must mobilize our industrial forces to show the other portions of the Empire and the allied countries what we produce," said Mr. Sherrard, "and we must prosecute a vigorous trade campaign in all these markets. For this we will need the co-operation of our transportation companies and our banks. We will need the assistance of our Government in securing information regarding markets and their needs; in providing technical education; in assisting scientific research.

"This is an opportune time for our Government to place the tariff on a scientific basis and beyond the influence of politics. This is an opportune time for our Government to urge trade agreements with the Empire and with our Allies, and to pave the way for Canada's entry into world trade."

Membership Declines

The report of the Membership Committee showed a decline in the twelve months of 78, leaving the total membership now at 2,983. The net loss in revenue was $1,055. Owing however, to the scaling up to higher classes of some members, the loss in potential revenue was only $300. H. P. Hubbard, who presented the report, advocated increasing the membership. The report was accepted.

Hon. Col. Thomas Cantley, vice-president, delivered an interesting address on "The Development of a Canadian Shipbuilding Industry," publication of which will be made in our June 29 issue.

Workmen's Compensation

Regarding the Workmen's Compensation Act, it was suggested in a special report of the Legislation Committee that pressure be brought to bear upon the Government for the adoption of the current cost instead of the capitalized plan. About $1,500,000 had been taken out of the industries of Ontario for this Act, while only $325,000 was needed. The Act did not make any provision for first aid or medical attention, and the Act should be amended to this extent. A benefit fund in factories by which workmen would contribute to this east was suggested. Mr. Shaw, in presenting the report claimed that Hon. I. B. Lucas or Hon. W. J. Hanna had intimated to a delegation of the C. M. A. that the Government would defray the cost of the administration of the Act, but that this was not done.

The report on the insurance tax criticizing same adversely was adopted.

Developing Export Trade

At the opening of the session on Wednesday a strong plea for a united effort to increase Canada's export trade after the war, especially to countries now allied with Great Britain in the struggle with Germany, was made by R. J. Younge. Mr. Younge is manager of the

Export Association of Canada, an organization which was formed after the discussion of Canada's exports at the meeting of the association last year, and which has done good work already in laying before the world Canada's abilities as a manufacturing country. Mr. Younge appealed for the hearty support of those present.

"If Canada is to make itself known as an industrial country it is its duty to tell the Allies what she is manufacturing," he declared. "It is all very well to say that Canada has responded to the calls which have been made upon her. She has done so, it is true. She has helped the Empire magnificently; but what of ourselves? The manufacturers are not responding to the appeal to unite in making known what we can do in the way of manufacturing. Only 104 out of some 19,000 or 20,000 manufacturers have put their hands into their pockets to help the movement. If you think the movement is worth while, show it. We have learned that there are opportunities of supplying goods, of keeping the working people employed and of making dividends. Let us have more results.

In connection with the report on Trade Development, W. H. Banfield, of Toronto, pointed out the serious problem which after the war would face many manufacturers who had installed costly machinery for the making of munitions. He also told of some of the troubles of a munitions manufacturer.

Co-ordination of Resources

A note of national importance was struck by Dr. J. C. McLennan, Professor of Physics at the University of Toronto, and president of the Royal Canadian Institute. Dr. McLennan suggested that a commission be appointed by the Government which would co-ordinate resources of the Canadian Manufacturers and cooperate with Canadian Universities towards furthering industrial research .

"There are buildings belonging to the Universities in British Columbia, Manitoba and other provinces, lying vacant," declared the speaker. "Millions of dollars are invested in plant and equipment by the University of Toronto with only two or three men working in them. There is more money invested in the universities of the country than in the railroads."

As showing the value of research, the speaker pointed to the General Electric Co., of Schenectady, U.S.A., which paid out $200,000 per year to experts employed in such laboratories. The larger proportion of the experts employed in those laboratories are Canadians," he declared amid applause. "Why do they leave Canada? Because they can get $1,200 or $1,500 a year, which, apparently, they cannot get here. We are steadily feeding the United States with our brightest and best young men."

The closing session was held on Thursday on the steamer Chippewa on the return trip from an outing to Niagara Camp. Motions were passed along lines previously discussed, which dealt directly with the most momentous problems facing Canada to-day. Among these were resolutions calling for the co-ordination of recruiting and production, and for the extension of industrial research work in the universities. One dealt with the best methods of defeating Germany on the field of battle, while the other aimed at the surest way of meeting her in the industrial war which is certain to be waged upon the conclusion of the present hostitities.

Election of Officers

The officers elected were as follows:—President, Col. Thos. Cantley, New Glasgow, N.S.; 1st vice-president, S. R. Parsons, Toronto; 2nd vice-president, W. J. Bulman, Winnipeg; treasurer, Geo. Booth, Toronto.

Executive Council—Messrs. W. K. McNaught, J. F. Ellis, P. W. Ellis, W. K. George, R. S. Gourlay, Toronto; C. A. Birge, R. Hobson, Hamilton; C. C. Ballantyne, Montreal; H. Cockshutt, Brantford, John Hendry, Vancouver.

Resources Mobilization

As suggested by the Special Committee dealing with the question, a strong resolution was passed calling upon the Government to mobilize all the resources of the country, both of men and material. This resolution, which was enthusiastically adopted, reads as follows:

"Resolved that the Canadian Manufacturers' Association express to the Government of the Dominion of Canada its firm conviction that fighting for one's country is the supreme duty cast upon all men in time of war, and that furthermore the burden of such service should be borne equally by all properly qualified men of the nation. The association also expresses its approval of any scheme, whether under the Militia Act or the Defence of the Realm Act, or otherwise, for the complete and effectual mobilization of the entire resources of Canada in men and material, and is of opinion that these should be placed unreservedly at the disposal of our country."

Inter-Empire Trade

Dealing with the question of tariffs, the association went on record as "favoring an arrangement that will give first care to the development of inter-Imperial trade by means of preferential tariffs: that will next give practical encouragement to the trade of our Allies: that will thirdly give us the protection of our general tariff against neutral countries: and that will lastly place the products of enemy countries under such fiscal and other disabilities as will effectually restrict their sale in our markets."

The association also expressed itself as in favor of the removal of the excise duty on alcohol used for manufacturing processes, scientific and medicinal purposes.

Closing Functions

The convention concluded with a banquet at the Royal Connaught Hotel, the guest of honor being Sir Thomas White, Minister of Finance. Hon. F. W. Crothers, Minister of Labor, and Lionel Curtis, Secretary of the Round Table Movement, England, were also present as guests. The new president, Col. Thos. Cantley, was in the chair and acted as toastmaster.

Mr. Cantley dealt at some length with the matters discussed during the sessions of the convention. Canada must awake to the possibilities which were knocking at her door as a result of the war. She must seek in every possible way to increase her trade so as to be better able to meet her share of the expense of the war. New lines of activities were opening up before the manufacturers. No one could say definitely what lay in the future, but Canada must be prepared to meet changed conditions and profit by them.

Col. Cantley believed that the time was ripe for the establishment of an active shipbuilding industry in Canada, greater than any other on the continent. He looked for assistance from the Government to bring this desired result about.

Sir Thomas White, who had inspected the munition plants of the city during the day, was deeply impressed with what he had seen of the enterprise of those in charge. He paid especial tribute to the Steel Company of Canada, whose cooperation during these strenuous times was most commendable.

Where soft castings are wanted, the rate of cooling has very much to do with the matter. Assuming that the silicon and carbon content are properly proportioned, slow cooling gives the desired results owing to the fact that the carbon very largely separates as graphite carbon. To secure the best results the sand should be used as dry as is possible to produce a good mould, and there should be a good body of sand of a porous character to back up that forming the actual mould. There is an advantage also in facing the moulds with plumbago, or very finely ground charcoal. This prevents the formation of a siliceous skin on the casting, although the carbonaceous coating to the mould is practically a mere film. Allowed to become practically cold in such moulds, castings should be as soft as the character of the iron will permit. Cast iron is not appreciably amenable to annealing after it has cooled, but during solidification and cooling down to about 300 degs. C., the rate of cooling exerts much influence.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

MILLER FOR 6-IN. H. E. SHELL BASE PLATES

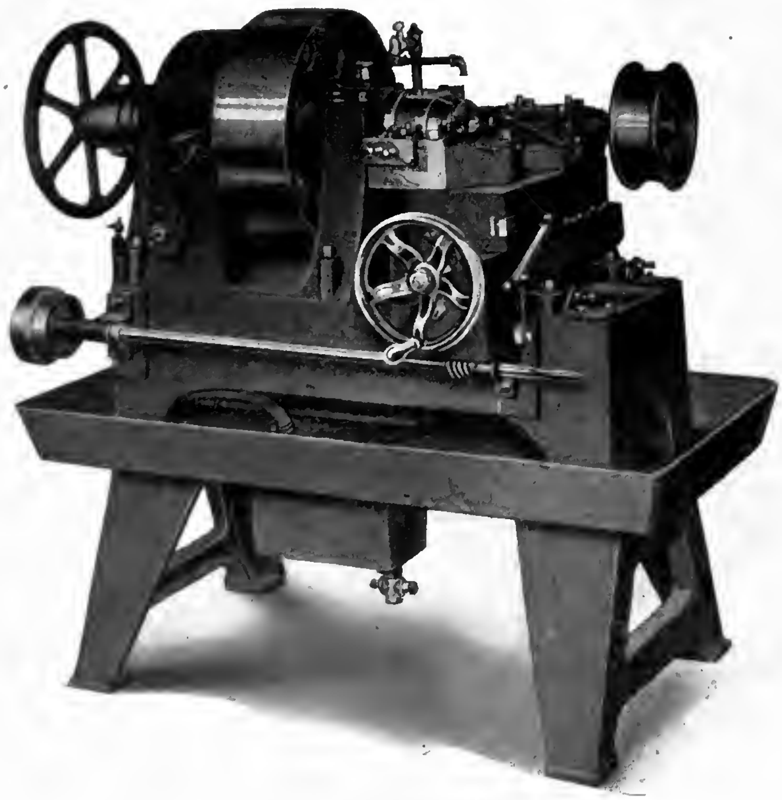
A MACHINE for milling base plates or plugs for 6-in. high explosive shells is being built by Edwin J. Banfield, Toronto. The machine is similar in many respects to the miller put on the market by Mr. Banfield some time ago for milling plugs for 18-pdr., 4.5-in., and 60-pdr. high explosive shells. It is, however, of heavier construction throughout, and can also be tooled up for machining bevelled plugs, which is an alternative proposition to the threaded plugs. The former type of plug has been adopted by many munition concerns, and the one machine can thus be used for machining either type of plug.

Detail and Operation Features

The machine has a 3⅞-in. diam. hollow shaft, driven by an 18 in. x 6 in. pulley direct from the line shaft, and the capacity is ten 6-in. threaded plugs per hour. As in the original machine, the plugs are held in a collet chuck with a drawback mechanism operated by a hand wheel. A double jaw clutch is mounted on the shaft, and so arranged that in the first position it engages the main pulley with the spindle for machining the plug, and in the second position, the shaft is revolved by a bronze worm and gear driven from an independent pulley at the back of the machine. The latter drive is used when milling the plug.

The front tool holder and milling attachment at the back are secured to the cross slide mounted on the carriage, which can be adjusted so that any required camber can be obtained. There is a micrometer adjustment in connection with the spindle operating the cross slide. The micrometer reads in thousandths and permits of great accuracy when setting up the tools to the fixed stops. The milling attachment has an independent drive and consists of a spindle carrying a standard cutter revolving in a sliding bearing bracket attached to the cross slide. Extending from the bracket is an arm carrying a chaser which engages with the threads on the outside of the collet chuck.

The tool for rough turning the outside diameter of the plug is fixed to the cross slide and under the work. When this operation is completed the cross slide is moved inwards and the first tool in the front tool holder roughs the face of the plug. This is followed by a similar tool, which finishes the face. The tool holder continues to travel inwards and another tool faces the back of the plug for a short distance, leaving a clean surface for riveting. Another tool chamfers the front edge.



MILLER FOR 6 IN. HIGH EXPLOSIVE SHELLS.

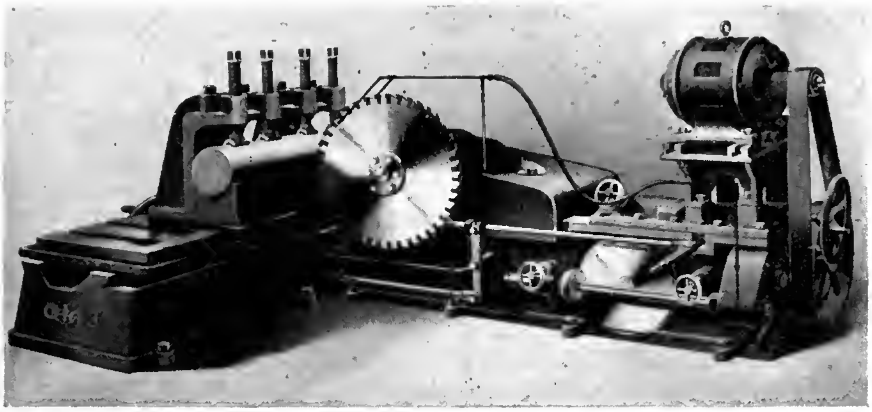
The next operation consists of milling the threads on the outside diameter of the plug, which is performed by the attachment on the cross slide at the back. The milling cutter is brought up against the plug and a dog slipped into position, which ensures the chaser nut engaging with the threads on the collet chuck. The clutch on the main spindle is then thrown back, bringing the worm drive, which has a ratio of 100 to 1, into gear and giving the slow motion necessary for milling the threads. The attachment is fitted with a hand lever for returning the cutter to its original position at the end of the cut. The feed shaft used during the initial operations is located in front of the bed and is driven by a 2-step cone pulley, giving two feeds to suit soft or hard plugs. A trip at the side throws the feed out at the end of the operation. The machine is equipped with a rotary pump having an automatic relief valve for controlling the flow of the cutting compound to the tool. All bushings have hard bearing metal.

Beveled Plug Production

For producing the beveled plugs, the machine is identically the same as described above, with the exception of the tooling fixtures. The milling attachment at the back is not required, and in its place is mounted on the cross slide at the back a tool holder with a tool for rough turning the back of plug. The first operation consists of rough turning the outside diameter and the bevel, which is performed by a set of cutters located on the cross slide immediately under the work. The back tool holder is then brought forward for rough turning the back of the plug. On the front tool post which is mounted on the cross slide are located four tools set in a way similar to the fixture described above. The first or forward tool roughs the face of the plug, which is followed by a second tool set just behind for making the finishing cut. The third or forming tool finishes the outside diameter and the bevel, while the fourth tool finishes the back of the plug for a distance of ⅜ in. to ½ in. Enough metal is left on so that the plugs when in the shell project any required distance above the level of the base.

COLD METAL SAWING MACHINE

THE accompanying photograph shows a high duty type of Q.M.S. cold metal sawing machine which has been placed on the market by the Vulcan Engineering Sales Co., Chicago. The machine is designed to drive inserted tooth saw blades to their maximum capacity and embodies numerous features tending toward convenience of handling and efficient operation.



COLD METAL SAWING MACHINE WITH FRICTION FEED AND CENTRALIZED CONTROL.

The saw is mounted on a flange forged on the end of the saw arbor, which is provided with two cut gears forged integrally with the arbor, the teeth of each gear being cut opposite the spaces of the other. These gears are driven by solid forged pinions cut on the worm wheel shaft in a staggered manner to match the gears, the resultant drive being characterized by an absence of back lash reducing the chatter of the saw blade to a minimum.

The illustration shows the machine with motor belt drive, the power being transmitted by spur gearing inside the bed to a splined shaft, which extends along the back of the bed, and drives the main worm and worm wheel. The former is of hardened steel and large diameter, provided with roller thrust bearings, and the latter is of two-piece construction consisting of a steel centre and special bronze rim. They are completely enclosed and run in grease.

The saw carriage is of box section construction and scraped to fit the shears of the main bed. It has full length bearing taper gibs to compensate for wear, hand adjustment, automatic stop and quick power return. Change of feed is obtained by a combination of friction disc and gears which provide a range of from 5-16 in. to 2½ in. feed per minute, the friction wheel being so arranged that it automatically sustains the proper contact with the friction disc. Two changes of peripheral or cutting speed are provided, either 30 and 50 ft. per minute, or 40 and 60 ft. per minute.

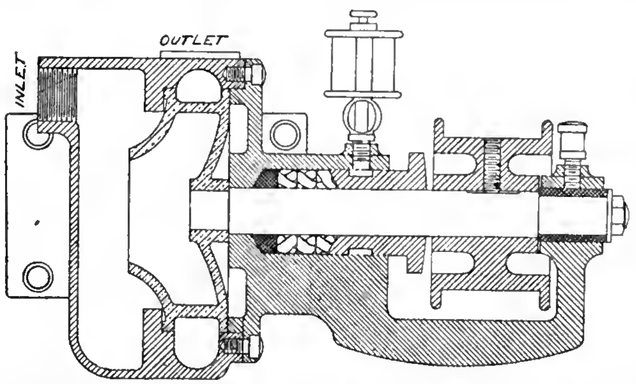
Levers and hand wheels controlling feeds, cutting speeds, and return movement are conveniently grouped together, the lever for engagement of feed and quick power return being extended to the front of machine as well. All gears run in oil, and internal bearings are lubricated by oil pipes leading to the exterior of the machine.

The work table is provided with tee slots, which enable the holding clamps to be adjusted as required. It is gibbed to ways on the top of cross bed, and has an oil trough cast completely around it. Lateral adjustment is obtained by rack and pinion operated by hand wheel on outer side of work table.

GRINDER LUBRICANT PUMP

A SPECIAL type of Fulflo centrifugal lubricant pump has been placed on the market by the Cincinnati Lubricant Pump Co., Cincinnati, which has been specially designed for use on grinding machines. In external appearance it is similar to the regular design of this pump, although the geared drive to impellor shaft has been altered to a direct pulley, on the outer side of which a bearing is provided, supported by an arm from the pump body.

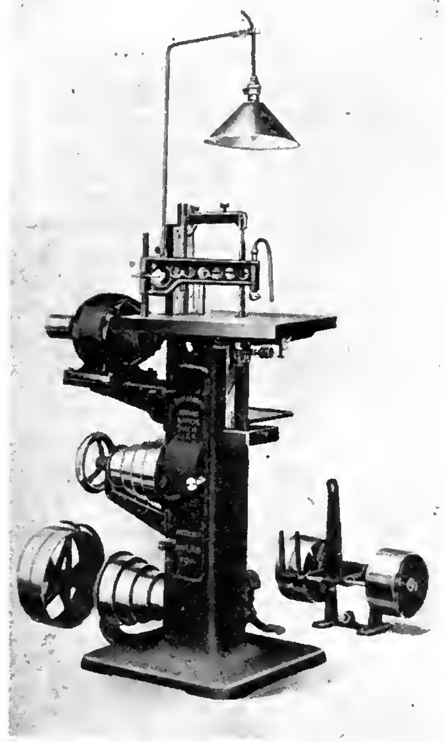
Owing to the high location of the inlet, the trap effect obtained dispenses with the necessity for priming and allows of the pump being mounted above the level of the liquid. The inner bearing is formed by the stuffing box gland, which is of cast iron, and is protected from the emery grit and dirt by a combination of metallic, graphite, rubber and flax packing. With a suction lift of 12 in. and a delivery head of 4 ft. the capacity of the pump at various speeds is as follows:—1,200 revs. per min., 5 gals.; 1,400 revs. per min., 10 gals.; 1,600 revs. per min., 15 gals.



CENTRIFUGAL LUBRICANT PUMP FOR USE ON GRINDING MACHINES

DIE FILING MACHINE

A SELF-CONTAINED filing machine of improved design is shown in the accompanying illustration. Motor-drive to the tight and loose pulleys is transmitted through a pair of step cones to the steel head which holds both ends of the files. The upper arm of the head is adjustable for varying length of file, and and the lower arm has adjustments for aligning the file so that the cutting edge travels vertically. Files from 4 in. to 12 in. long can be used, of any shape, and either straight or tapered, as well as any thickness of hack saw blade, all cutting being done on the down stroke and release on the up stroke.



MOTOR-DRIVEN FILING MACHINE WITH FOUR-SPEED CONE PULLEYS.

The table is 17 in. by 18 in., and 39 in. high above the floor. It is grooved diagonally with small holes to let filings drop through, a

blow pipe being fitted to keep the work clear. A seven degree tilt in each direction is provided, and a clamping arm is also arranged, which has a double hinge, and screw adjustments for clamping work to the table, enabling the friction between the work and the table to be regulated so as to eliminate oscillation of work when the file releases on the up stroke.

The machine has an adjustable stroke from 1 in. to 7 in., weighs 375 lbs., and requires floor space of 22 in. by 36 in. It is built by W. D. Rearwin, Grand Rapids, Mich.

HEAVY DUTY SINGLE PURPOSE LATHE

THE Hyde Engineering Works, William Street, Montreal, have brought out a new design of heavy duty lathe for machining H.E. shells from 4.5 in. up to and including 9.2 inch. The design, we understand, is a combination of ideas of several engineers connected with a number of the largest shell plants in the Montreal district. Fig. 1 shows the machine fitted with a turret head, although it has been found that a turret is not always entirely satisfactory for boring heavy shells. In many cases firms making the latter have adopted various methods of boring.

This lathe can be equipped with a tailstock cast solid on the carriage instead of the turret, having a spindle (or boring bar) of 5 inches diameter; the spindle having a large standard taper hole for holding the various boring tools. Under these circumstances the shell would be held in a chuck, and would revolve with the lathe spindle. In addition to the foregoing, if so desired, the shell can be secured in a cradle cast solid with the carriage; in which event a special boring bar bolted to the face plate of the lathe spindle is furnished.

The general design and construction of this lathe appears to combine strength with efficiency. There is also an absence of unnecessary and complicated devices, thereby contributing to accurate operation even with unskilled labor. The headstock is cast solid with the bed of the lathe, and the housings are fitted with bronze bearings, which offer a projected spindle area of 60 square inches on the front bearing and 27½ square inches on the rear. The face plate is solid with the spindle, which is a steel casting, having an overall length of about 38 inches. The front bearing is 6 inches in diameter by 10 inches long, and the rear bearing is 5 inches diameter by 5½ inches long. Lateral motion is taken up by means of fibre washers, placed on the inner side of either housing, adjusting nuts for taking up the wear being located at the back of the rear bearing. The end wear is reduced to a minimum by use of a thrust bearing placed directly behind the face plate. This bearing consists of two hardened steel discs and a series of ⅝-inch steel balls held in a brass casing. The spindle has a large hole through the centre, and can be equipped with the necessary attachments for operating the chucks with compressed air.

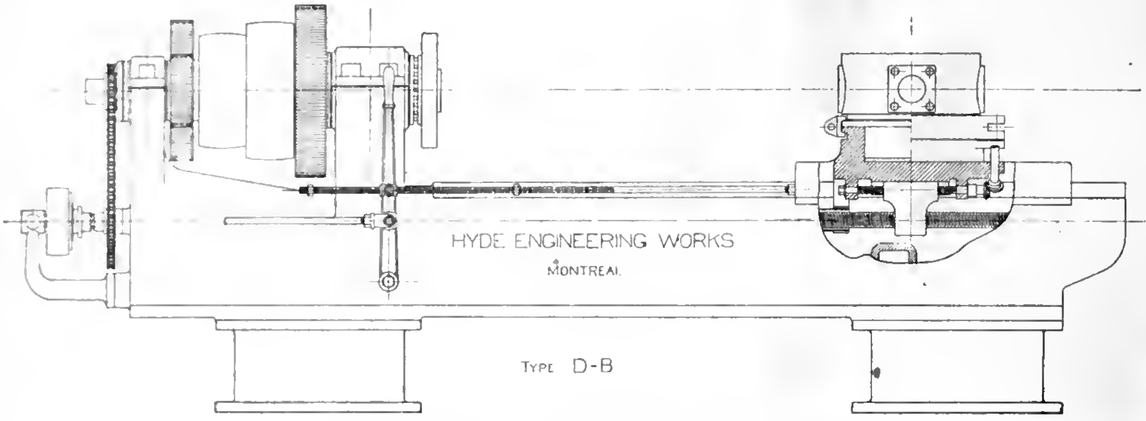


FIG. 1. HEAVY DUTY SINGLE PURPOSE LATHE.

Drive Feature

The drive is obtained from cone pulleys, 15 and 16 inches in diameter of 6½-inch face; these, with heavy cast iron gears of 3 and 4-inch face, offer a speed ratio of 1 to 8.9. The carriage is of extra heavy design, and is equipped with hand-feeding arrangement. A feature of the construction is the method of securing the turret to the main saddle. In addition to the central bolt, a specially-designed adjustable clamping band insures a maximum degree of rigidity and stability. This clamp is operated by means of a toggle device, which also controls the locking pin mechanism. The

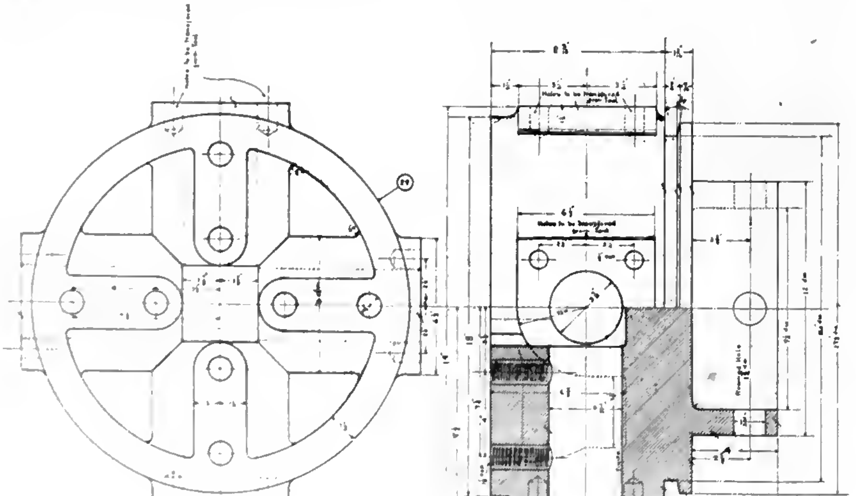


FIG. 2. PLAN AND SECTION OF TURRET HEAD.

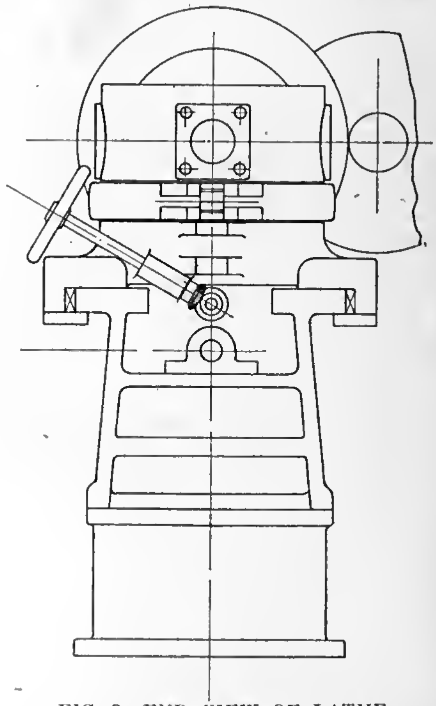


FIG. 3. END VIEW OF LATHE.

carriage is fitted with gibs at the front and rear for accurate alignment. Positive feed is obtained by the use of sprockets connected by a heavy chain; and several changes of feed are available by using different sprockets. The lead screw is placed between the ways of the lathe, so that the pull on the carriage be-

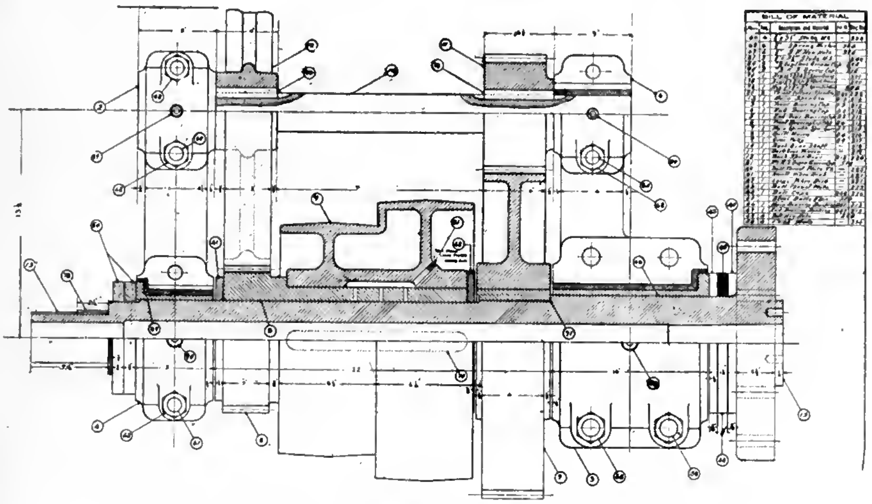


FIG. 4. SPINDLE ASSEMBLY, SINGLE PURPOSE LATHE.

ing in the centre reduces any tendency of uneven wear upon the ways of the lathe. The carriage nut is of the solid type, and by means of an auxiliary screw has lateral adjustment for hand feed. The power feed is semi-automatic; an adjustable rod, one end of which is secured to the carriage, passing through a knuckle on the feed lever. Stop nuts can be located on this rod to release the feed at any desired point. The reverse motion of the carriage is rapid, being obtained by a friction clutch and pulley driven from the main or counter-shaft overhead. Provision has been made for several speeds of feed ranging from 1-64 to 1/4 inch.

Interchangeable Parts

All parts of these lathes are interchangeable, and repairs or changes from boring to turning, or vice versa, can be accomplished with little interruption or loss of time. The length of the carriage is 36 inches, and the extreme travel, 54 inches. Diameter of turret is 18 inches, with holes of 3½-inch diameter. The tailstock, which slides into the centre of the ways, has a bearing of 24 inches long, and is rigidly clamped. The boring bar is 5 inches in diameter, and has a bearing 24 inches long. The length of the ways is 90 inches, and the overall length is 114 inches. The total area of carriage bearing is approximately 288 square inches, and the total weight of the lathe finished is about 9,000 pounds.

WIRE COILING MACHINE

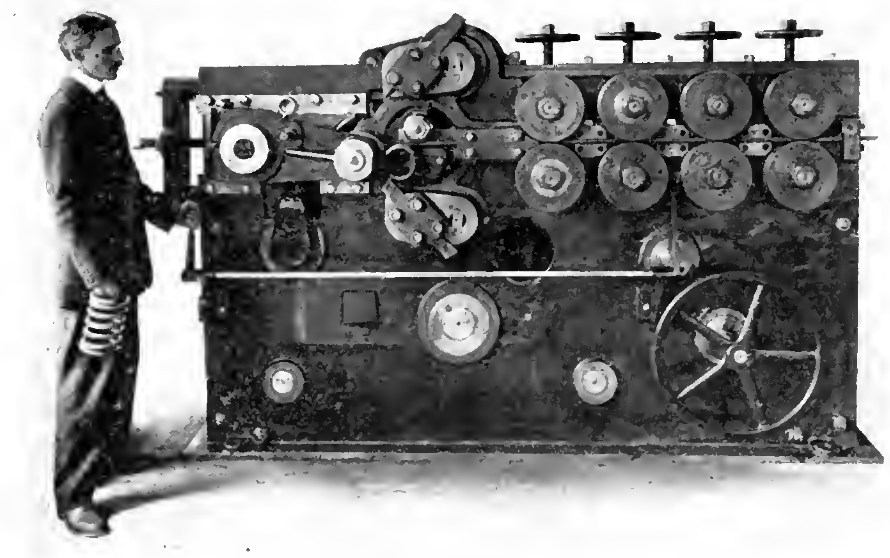
ONE of the largest cold coiling machines ever built is shown in the accompanying photograph, which shows a machine capable of handling oil-tempered stock 5/8 in. square. It is adapted to making extension or compression springs, and will feed as much as one hundred feet of wire into a single spring.

These machines do not produce the springs by coiling around an arbor, but by feeding the wire forward by feed rolls against a coiling point or deflector, a predetermined amount of wire being put into each spring by the machine. Coiling and cutting off are alternately performed automatically, the coiling mechanism being stopped while the spring is being cut off. The only function of the arbor is to provide a cutting edge against which the cutter may carry the wire when shearing it off.

The diameter and contour forming mechanism is controlled by means of a cam, the design of which is such that only one cam is needed to produce any kind of a taper spring, and a single pair of cams will produce every variety of barrel-shaped springs.

The pitch is controlled automatically, and springs may be produced with an open spiral, or the end coils may be laid close to any desired extent. This latter feature obviates the costly method of squaring ends by heating and pressing.

This No. 5 Universal Coiler is the largest of a series of such machines designed and manufactured by Sleeper & Hartley, Inc., Worcester, Mass. It occupies a floor space 6 ft. by 8 ft.; weighs 15,000 lbs., and handles 5/8 square stock at a speed of about 50 ft. per min.



COLD COILING MACHINE FOR HANDLING 5/8-IN. SQUARE OIL-TEMPERED STOCK.

TOOLS AND TEMPER

THE use of poor tools is an economic waste that is almost a tragedy. This is true not only because good tools do better work, but also because they put the workman in a better frame of mind so that he will have pleasure in turning out his work. Putting a man in tune with his job is largely a matter of furnishing the proper equipment and conditions.

The man who quarrels with his tools is not a good workman because his physical and mental energy is expended in the wrong direction. The expert motorist does not need to think of the proper levers to operate in an emergency. He thinks only that he must stop quickly. Hands and feet obey unconsciously. So with tools. They should perform their functions so well that their operation is practically automatic. The operator should be free to think only of the results he wishes to achieve.

Every skilled workman has a certain rhythm with which he performs his daily task. This rhythm, because largely unconscious and automatic, makes his work not only easier but also more accurate. Disturb this rhythm by compelling him to use poor tools, so that he must consciously direct his motion, and you will lower the quality and quantity of his work.—Herbert's Monthly.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. JUNE 22, 1916 No. 25

NO "HALF COCK" C.M.A. ACTIVITIES

THE trend of the resolutions passed at the recent Canadian Manufacturers' Association Convention gives unmistakable evidence that our own and the Imperial Government have the earnest and undivided support of the members, both individually and collectively. Will winning the war in this one-sided fashion usher in commercial failure as a result? In Britain, as in Canada, manufacturers are bending every energy to meet the military and naval situation and little dissatisfaction is now expressed at the results. The latter are in fact so gratifying and have been so for some considerable time past, that those responsible for our trade and commerce are taking opportunity to cast around and exercise their minds over peace-time eventualities. Withal, it may be said that there is little indication in Canada, at least, of encouragement to our manufacturers to anticipate and prepare for the trade upset and trade war that is practically certain to ensue when hostilities in the field cease.

Of the various resolutions presented and carried at the C.M.A. Convention, this much may be said, that all of them merit the attention and consideration of responsible Government at Ottawa. Not only so, but we are of opinion that just the necessary pressure will be forthcoming to develop action there. The election of Col. Cantley to the president's chair was not of course fortuitous at this time, as he was next in order of precedence, yet, under such circumstances as Canadian manufacturers now find themselves, his elevation to the position of chief executive officer of the association must be conceded the best possible. We not only expect to see the C.M.A. make rapid strides as an institution, under his influence and direction, but its being made the instrumentality through which the Dominion Government will initiate and provide for the progressive development of an industrial and commercial enterprise, from which the present administration and its predecessors have held back, or to which nothing but callous indifference has in the past been exhibited.

At no time in its history, has the Canadian Manufacturers' Association Executive had a like responsibility placed upon its shoulders as has that appointed for the ensuing year; on the other hand the opportunities for worth-while achievement are meantime more diversified and great, and, actively and passively, the backing of our citizens generally is more substantial and solid. The new president's attitude on the Sunday labor question—no "half cock" treatment will, we think, be characteristic of the like attitude to be taken by his executive in prosecuting its work of Government regeneration.

INCREASED PRODUCTION THROUGH CO-OPERATIVE EFFORT

AN article under the above heading in another section of the present issue merits some attention from our foremen and superintendent readers, the particular feature discussed being one that is probably overlooked in these strenuous days and nights of munitions production. We are inclined to think that little thought has been given, much less little effort made to bring the night and day operator together on a common-interest output basis. The suggestion that loss of output results, because the night and day shift men on individual machines never see each other, is a pertinent one, and gains point from the instances quoted which came under the observation of our correspondent.

The manufacture of munitions is not competitive, and a two-shift plant operation is meantime quite common in our machine shops, etc. Much valuable data, comparative with respect to operator output must therefore be readily at hand. In view of this, we are of opinion that an interchange of experiences in our editorial columns would be extremely opportune, contributing, as it inevitably will to not only an increased national response to the call of Empire, but to a more highly developed mechanic intelligence. Time and temper lost by one or other, or even by both operators on a particular machine through more or less paltry and many times imaginary inconveniences, affect materially a shift output, and if, by the slight effort required to assimilate as far as possible the individual traits and working methods of each pair of men, these two factors can be eliminated, the outcome will surely be worth while.

PRESENT CONDITIONS AND LATER PROBLEMS

DISSERTATION on "after the war" and the "future of munitions factories," have become frequent to the point of being commonplace. Schemes of many kinds have been advanced regarding the ultimate fate of war-time industrial establishments, but they all lack that definiteness which is essential to the success of any commercial proposition. Haphazard methods cannot compete against organized efforts, and these in turn cannot be inaugurated without some definite purpose in view.

Two outstanding features of the present situation would seem, however, to offer promise of automatically adjusting themselves to subsequent conditions, i.e., the disposal of specialized machines, and the absorption of temporary labor. While many machine tools have been made to special designs, they have accomplished such satisfactory work that their ultimate consignment to the scrap heap will be more profitable than reconstructing them for other purposes, or keeping them in storage on the chance of ultimate utilization. This has been rendered possible by the high degree of simplicity and "single purposeness" which has been evidenced in later machines.

That the many machine operators, pro tem, will elect to remain permanently in machine shops, under more or less confined conditions and reduced wages when peace returns, seems rather unlikely. Patriotic impulses and financial returns have been the principal sources of much present energy but a return to more placid, though less profitable paths will be welcomed by many workers with a corresponding reduction in one feature of a problem which persists in the minds of many manufacturers.

INDUSTRIAL NOTABILITIES

ALBERT FRANK FIFIELD, general manager the Metal Drawing Co., St. Catharines, Ont., was born at Lowell, Mass., February 8, 1876, the son of Frank and Abie Mary (Cummings) Fifield, Ashland, N.H. He was educated in the public and preparatory schools of New Hampshire, and began his business career by operating a machine shop at Ashland, N.H., between the years 1897 and 1905, coming in the latter year to the Jenckes Machine Co., Sherbrooke, Que., as construction superintendent. In 1907 he went into business at St. Catharines, Ont., by engaging in the buying and selling of machinery.

ALBERT FRANK FIFIELD

Later he organized the Reo Sales Co. at St. Catharines, the special purpose of which was the distribution of the Reo Motor Car for pleasure and commercial service in Canada. A coast to coast trip on a Reo car, the latter being furnished by Mr. Fifield, as well as the operator crew, was undertaken and successfully accomplished, a piece of enterprise which had the unique distinction of being the first of its kind in the Dominion. In 1914 the Metal Drawing Co. was organized at St. Catharines, with Mr. Fifield as general manager, following which the latter sold out his various other business interests.

Mr. Fifield takes a live interest in many of St. Catharines' activities, among which may be mentioned his inauguration of the American Patriotic Fund, which is partly diverted to the general city charities; his past chairmanship and present executive membership of same, and his committee membership of the Canadian Patriotic Fund.

He married Velma Faunce Linscott, daughter of A. N. Linscott, Damarscotta Mills, Me., on May 25, 1904, the family consisting of two daughters. His clubs are: St. Catharines, Niagara (Niagara Falls, N.Y.), Buffalo Motor, St. Catharines Golf, and St. Catharines Canoe. His societies are the A.F. and A.M., and his recreations motoring, angling and hunting.

In religion Mr. Fifield is a Protestant independent. His residence is at 157 Ontario Street, St. Catharines, Ont.

—Photo, Courtesy International Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$18 70	
Lake Superior, charcoal, Chicago	19 75	
Michigan Charcoal iron	28 00	
Ferro nickel pig iron (Soo)	25 00	

	Montreal	Toronto
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Hamilton, No. 1	$26 00	$24 00
Hamilton, No. 2	26 00	24 00
Victoria, No. 1	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base, Toronto	3.00
Steel bars, base, Toronto	3.25
Steel bars, 2 in. and larger, base	5.25
Iron bars, base, Montreal	3.00
Steel bars, base, Montreal	3.25
Twisted reinforcing bars, base	3.30
Bessemer rails, heavy, at mill	2.50
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	...
F.O.B., Toronto Warehouse.	**Cents**
Steel bars, base	3.10
Small shapes	3.75
F.O.B. Chicago Warehouse	**Cents**
Steel bars	3.10
Bars, 2 in. and up	4.00
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper, carload	$32 00	$31 00
Electrolytic copper	32 00	31 00
Castings, copper	31 00	30 50
Tin	48 00	48 00
Spelter	17 00	17 00
Lead	9 00	9 00
Antimony	31 00	33 00
Aluminum	66 00	64 00

Prices per 100 lbs.

BOILER PLATES

	Montreal	Toronto
Plates, 1/4 to 1/2	$4.25	$4 25
Heads	4 50	4 50
Tank plates, 3-16 in.	4 75	4 75

WROUGHT IRON PIPE

Prices in effect April 26, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 06	5 31
1/2 in.	3 91	6 08
3/4 in.	4 72	7 65
1 in.	6 97	11 31
1 1/4 in.	9 43	15 30
1 1/2 in.	11 28	18 29
2 in.	15 17	24 61
2 1/2 in.	23 99	38 90
3 in.	31 37	50 87
3 1/2 in.	37 72	61 18
4 in.	44 69	72 49
Lapweld		
2 in.	$17 02	$26 46
2 1/2 in.	25 16	40 07
3 in.	32 90	52 40
3 1/2 in.	39 56	63 02
4 in.	46 87	74 67
4 1/2 in.	57 15	90 81
5 in.	66 60	105 82
6 in.	86 40	137 28
7 in.	116 62	179 70
8 in. x 25 lbs. per ft.	122 50	188 75
8 in. x 25 lbs. per ft.	141 12	217 44
9 in.	169 05	260 48
10 in. x 32 lbs. per ft.	156 80	241 60
10 in. x 40 lbs. per ft.	201 88	311 06

List for Ontario, Quebec and Maritime Provinces

OLD MATERIAL

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 00	$17 00
Coper, crucible	20 25	20 50
Copper, heavy	20 50	21 75
Copper wire	20 75	21 75
No. 1 machine compos'n	15 00	15 75
No. 1 compos'n turnings	13 75	13 75
New brass clippings	14 50	14 75
No. 1 brass turnings	11 50	12 00
Heavy melting steel	9 00	9 50
Boiler plate	11 75	10 50
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	14 00	13 50
Shafting	17 00	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	11 50	10 00
Stove plate	10 50	10 50
No. 1 machin'y cast iron	14 75	14 50
Heavy lead	5 50	5 50
Tea lead	5 50	5 50
Scrap zinc	11 50	11 00
Aluminum	37 00	35 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Coach and lag screws	50
Stove bolts	62 1/2
Plate washers	25
Machine bolts, 3/8 and less	40
Machine bolts, 7-16 and over	30
Blank bolts	30
Bolt ends	30
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in. $3.75 per lb. off	
Nuts hex., over 1 in. $2.00 per lb. off	
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	37 1/2
Boiler rivets, base 3/4-in. and larger	$4.85
Structural rivets, as above	4.75
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS

	Per Cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	50
Finished Nuts over 1 in.	37 1/2
Semi-Fin. Nuts up to 1 in.	50
Semi-Fin. Nuts over 1 in.	37 1/2
Studs	45
Taper pins	.65
Coupling bolts	net
Planer head bolts, without fillet	.15
Planer head bolts, with fillet	net
Planer head bolt nuts up to 1 in.	.60
Planer head bolt nuts, over 1 in.	.55
Planer bolt washers	list plus 10
Hollow set screws	list plus .20
Collar screws	list plus .20
Thumb screws	.20
Thumb nuts	.75

BILLETS

	Per gross ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	40 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES

Standard steel wire nails, base	$3 75	$3 70
Cut nails	3 40	3 40
Miscellaneous wire nails		65%
Pressed spikes, 5/8 diam., 100 lbs.		$3 90

MISCELLANEOUS

Solder, guaranteed	0.29
Solder, strictly	0.28½
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	3.00
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medals, per lb.	0.20
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls., gal.	0.63
Linseed oil, raw, single bbls.	0.75
Linseed oil, boiled, single bbls.	0.78
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Packing, square headed	0.25
Packing, No. 1 Italian	0.30
Packing, No. 2, Italian	0.23
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per Cent.
Standard drills to 1½ in.	45
Standard drills over 1½ in.	5
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	net
Bit stock	55
Ratchet drills	net
Machine bits for wood	15
S.S. drills for wood	45
Wood boring brace drills	25
Electricians	20
Sockets	30
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks ....list plus	5
Bridge reamers	55
Centre reamers	net
Chucking reamers	net
Hand reamers	5

High-speed drills up to 1½ in. and over 1½ in. Double list plus 20 per cent.

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60 per cent.; headers, 60; flanged unions, 55; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$4 15	$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 50
Canada Plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 75	7 75
Fleur-de-Lis, 28 B.W.G.	7 35	7 35
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	7 00	7 00
Premier, 10¾ oz.	7 30	7 30

PROOF COIL CHAIN

¼ in.	$9.45
5-16 in.	9.10
⅜ in.	8.35
7-16 in.	7.15
½ in.	6.95
9-16 in.	6.95
⅝ in.	6.80
¾ in.	6.70
⅞ in.	6.55
1 inch	6.40

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B.B

⅛ in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16 in.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	60-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES

Size	Seamless	Lapwelded
1 in.	$19 55	.....
1¼ in.	19 55	.....
1½ in.	19 55	14 00
1¾ in.	25 00	15 00
2 in.	25 00	15 50
2¼ in.	28 50	18 50
2½ in.	32 00	21 00
3 in.	40 00	24 00
3½ in.	45 00	28 00
4 in.	50 00	34 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 8.35
Galvanized, 24 wires, 1 in.	24.05
Black, 19 wires, ⅜ in.	6.90
Black, 19 wires, 1 in.	21.30

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	40%
Standard	40 & 10%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun. Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun. Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto

WASTE

WHITE	Cents per lb.
XXX Extra	.16
Peerless	.16
Grand	.15
Superior	.15
X L C R	.14
Atlas	.14
X Empire	.13
Ideal	.13
X press	.12
COLORED	
Lion	.10¼
Standard	.9¼
No. 1	.9¼
Popular	.8¼
Keen	.7¼

WOOL PACKING

Arrow	
Axle	Prices on
Anvil	application
Anchor	

WASHED WIPERS

Select White	
Mixed colored	Prices on
Dark Colored	application

This list subject to trade discount for quantity

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.37 to .39
Tin	.58 to .60
Zinc	.26 to .28

Prices Per Lb.

COPPER SHEETS

	Montreal	Toronto
Bars, ½ to 2 in.	$47 50	$47 50
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 in.	46 00	46 00
Copper sheet, tinned, 14 x 60, 14 oz.	55 00	55 00
Copper sheet, planished, 14 x 60 base	58 00	58 00
Braziers' in sheets, 6 x 4 base	47 50	47 50

BRASS

Brass rods, base ½ in. to 1 in. rd.	0.55
Brass sheets, 8 in. wide, 20 oz.	0.60
Brass tubing, seamless	0.55
Copper tubing, seamless	0.55

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

RUBBER BELTING

Standard	50%
Best grades	30%

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	$12 50	$13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy	.35
Copper, sulphate	.15-24
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., June 19, 1916.—The industrial situation is gradually assuming a condition which seems to indicate that the top has been reached. While it is not anticipated that marked declines will be shown in many raw or semi-finished products, it is thought by many that prices will, with few exceptions, remain at their present levels for some time, until further developments justify a change. In some industries a diminution in the amount of night work appears to indicate that the apex of production has been reached, but the majority of industrial plants throughout the country are still working at forced pressure on accumulated orders. The monthly commercial letter of the Canadian Bank of Commerce states that "At no time has a larger proportion of the industrial plants of the country been actively employed than to-day, and an increasing quantity of domestic raw material is being utilized. Textile, iron and steel, boot and shoe, packing and other industries are operating as fully as the supply of labor will permit." The value of the manufactured products of Canadian industries for 1910 was $1,164,000,000; while it is conceded that this year's products will total approximately $2,000,000,000

Pig Iron.

While the situation is apparently unchanged there is a tendency to lower prices. Production continues at furnace capacity, with no cessation in the demand for steel-making pig; and slightly additional inquiries for foundry iron. A reduction of 25 cents per ton is general in foundry pig quotations.

Steel.

The general iron and steel situation is quiet, and with the majority of mills working to capacity it is not expected that much additional buying will be done for some time. It is anticipated that early in the fall increased activity will develop, when consumers, who have not yet covered their requirements for the last quarter of this year and the early part of next, will be in the market. Recent inquiries for plates have been comparatively light and near by positions have been obtained at prices slightly lower than the nominal quotation. Mills are however unable to take large orders for delivery under five or six months. Following the slight activity recently shown in sheets, the market has quietened down again as the trade appear to be well covered for the remainder of the year. The demand for all wire products is very heavy and the market is strong; prices on plain and galvanized wire have been advanced $4 a ton, Pittsburg. An additional $2 a ton is also noted in the Pittsburg quotation on railroad spikes. Wrought iron pipe and boiler tubes are in good demand and quotations are firm.

Metals.

With the exception of aluminum, which is growing firmer, all the metals are unsettled and quiet. Spelter is quiet and unchanged. Lead is slightly easier in the open market, but Trust prices are firm. Antimony is very dull, on sharp declines. Aluminum is showing a little increased strength after a period of steady going.

Copper.—There have been rumors of heavy English buying pending, but nothing has developed to confirm this report. During the past week the London market has declined £10½ on standard spot; £9½ on futures and £2 on electro spot; present quotations being £113, £110 and £140 respectively. New York quotations have declined ¾ cent with current prices nominal at 27½c for prime lake and electrolytic, and 25¼c for castings. Dealers here report a quiet, but steady, market with prices unchanged; present quotations being 32c for lake and electrolytic, with castings at 31c per pound.

Tin. — Future prices are becoming easier, consumers being attracted by the declining quotations, and considerable inquiry has resulted. However, there is apparently little ground for anticipating any sharp decline in the price of tin, as the consumption at the present

time is continuing at a record rate, with little prospect of relief from new mills now in course of construction. Daily weakness in the British markets has resulted in a total decline on the week of approximately £9½ on spot and futures; the former being now quoted at £178 and the latter at £178½; straits tin is slightly higher at £179. New York has been effected by the foreign situation to the extent of a 3c decline on straits tin, latest quotation being 41¾c per pound, nominal. The local market has not yet been affected by foreign conditions and dealers here report an unchanged situation with prices steady at 48c per pound.

Spelter.—No developments have taken place during the week; holders of metal do not appear anxious to offer it for sale, and are looking forward to a stronger market. New York is quoting 13 1-6c, which is a decline on the week of ⅞c per pound. Montreal dealers report unchanged conditions of weakness. Prices are firm at 17c per pound.

Lead.—The Trust price is firm at 7c with the outside quotation 1-5c lower. The local market is quiet with prices firm at 9c per pound.

Antimony.—The available supply of antimony is apparently increasing and the market is becoming very dull. New York has declined on quotations to the extent of 2½c on all grades; the nominal price being 20c per pound. Dealers here are quoting 31c on a weak and declining market.

Aluminum.—While no change is noted in the local market, an advance of 3c is reported on the New York Market. It might be interesting to note that the price of aluminum at present around 66c, was about 32c a year ago, while the average price during the year 1914 was slightly under 20c per pound.

Machine Tools and Supplies.

The general situation throughout the machine tool industry is practically unchanged. Large shell manufacturers are still receiving equipment, and the chief draw back to maximum production is the inability to obtain delivery on the required machinery. The demand for the lighter tools is gradually decreasing, the greater volume of business being done in the heavier tools. The demand for all classes of supplies continues heavy, the situation still remaining difficult owing to the scarcity of raw material. While prices generally are unchanged the tendency is for slight reductions.

Scrap

Dealers in old material are reporting a fair volume of business, but no increased interest is being shown by consumers and dealers are not anxious to stock up at present prices. With the exception of the light grades, scrap coppers are off ¼c per pound; brass clippings and turnings have declined ½c present quotations being 14½ and 11½ per pound. Wrought iron scrap is more plentiful and a decline of ½c is noted on the local market. Scrap zinc is stronger, an advance of ½c putting the current price at 11½c; and scrap aluminum is quoted at 37c, an advance of 1c per pound.

Toronto, Ont., June 20.—The industrial situation continues favorable and the demand for manufactured products is steadily increasing. New industries are being established, and many firms are extending their plants to take care of the increased demand, and also in view of the continued period of prosperity which is anticipated. Production is, however, being curtailed owing to scarcity of labor and of raw materials. Although greater efficiency in operation is off-setting this to some extent, it is generally anticipated that the shortage of some manufactured goods now being felt will become more acute later on in the year owing to the greater number of enlistments and to there being little chance of any improvement in the raw material situation.

Although the upward movement in prices appears to have almost come to a standstill, there is no indication of any weakness in the situation. Prices of manufactured products have been adjusted to meet the cost of raw materials, and, as it does not appear that the latter will advance further, to a marked extent at least, and only in isolated cases and subject to special conditions, it is unlikely that finished goods will advance, although prevailing high prices will no doubt be maintained for some time to come. Prices of steel products generally are unchanged, except boiler tubes, which have advanced again. The ingot metal markets are still weak, and further declines have to be noted. The demand for machine tools is more active, following the placing of orders for large calibre shells.

Steel

The market continues very firm and prices are practically stationary. Indications point to the top of the market having about been reached, although further advances in some steel products subject to certain conditions may be expected. There is, however, no sign of weakness in the steel market, and there is every reason to believe that the present high level of prices will be maintained for the remainder of the year. The mills are as active as ever, orders for munitions accounting for a considerable proportion of their output. The only advance of importance to note this week is lapwelded boiler tubes. The new prices, 10% higher, are for tubes made to the new specifications, which calls for thicker metal. Some makers of iron and steel tubes are not taking on new orders, as they are filled up for the remainder of the year. Prices of wrought iron pipe are very firm; the current demand is heavy, and some mills are sold up for three or four months. The skelp situation is unchanged, and deliveries are still very backward.

Prices of wire rods are firm, and supplies are scarce owing to the export demand for rod material being heavy. It is very difficult to get wire rods from the States, as the makers there are filled up with orders. Boiler and tank plates are very firm and prices unchanged. The new demand for plates is not as urgent as it was some time ago, but deliveries are still backward.

The new demand for sheets, although fairly heavy, has quietened down to some extent, the trade being covered for the remainder of the year. Specifications, however, are reported to be coming in freely, and the sheet mill interests believe that the lull is temporary. Prices of black sheets are firm, with an upward tendency owing to the possibility of higher prices having to be paid for sheet bars. Galvanized sheets are irregular, but more interest is being shown by consumers in the market. The decline in spelter has caused a weaker tendency in sheets, but prices are unchanged in the meantime.

The steel market in the United States is quieter, and it is not believed that there will be much new buying until September. Import inquiry for finished steel continues heavy, but domestic buying is lighter. All the mills have large unfilled tonnages, and it is considered probable that even if demand declined further there will be little, if any, reduction in prices. Steel bars are unchanged at 2.75c and plates at 3.75c, but beams are a little lower at 2.50c Pittsburgh. Open-hearth billets and sheet bars have declined $2, and are now quoted at $40 per ton Pittsburgh.

Pig Iron

The market is quiet and prices have an easier tendency, although unchanged in the meantime. The demand for steel-

---

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

making grades is as insistent as ever, and foundry irons are more active.

Scrap

The market is dull, with prices weak, being influenced largely by the decline in ingot metals. Buying is of the hand-to-mouth order, and is in light volume. Heavy melting steel is firm and higher, but zinc and lead have both declined.

Machine Tools

Business in machine tools is more active than it has been for some time, due principally to the recent orders for large calibre shells. Some new firms have received orders and so require complete equipments. The machine tools required consist principally of large swing lathes, high-duty drills and cutting-off machines. Deliveries are good on heavy tools, but backward on standard equipment.

Supplies

The demand for machine shop supplies continues brisk, and prices are much steadier. Brass tubing has advanced, as has also asbestos wick packing. Alfalfa belting has advanced about 25 per cent. This is a fibre belting which is used extensively in the operation of agricultural machinery. Linseed oil has again declined, and is now quoted at 75c and 78c for raw and boiled respectively. Turpentine is also lower at 62c per Imperial gallon. Gasoline is unchanged, but firm, and may advance.

Metals

A general weakness prevails in the metal markets, with a decline in prices of all except lead and aluminum. The weakness is really due to the fact that production is now greater than consumption, although the latter is still heavy. There has been some falling off in war orders, and the inflated prices are keeping consumers out of the market. Tin is, however, an exception, as this metal is not being used for munitions, and is, therefore, not subject to the same influences. The tin market, notwithstanding this, is being affected by the other markets, and is lower. Copper is lower, due to second-hands making concessions, but the position of this metal is a strong one, and a reaction to higher prices is quite probable. The demand for lead has fallen off, and the market has a weak tendency, although prices are unchanged. Spelter and antimony are both lower, but aluminum is unchanged.

Copper.—The market is quiet and lower, with second-hands making further concessions. Consumers are not in need of spot copper, and the lower prices have not attracted business. Producers are sold up for some months, and they are still holding out for high prices. The demand for copper will be heavy throughout the year, and the market may possibly recover. Quotations are entirely nominal and lower at 31c per pound.

Tin.—The market is weaker, but more in sympathy with other metals than as a result of any change in the situation. A sharp break in London has been followed by a decline here. Consumers are not at all disposed to enter the market at this time, and some sellers report that the inactivity since the first of the month has been most pronounced. Tin is comparatively cheap at present prices, and a recovery is highly probable. Tin has declined 2c, and is now quoted at 48c per pound.

Spelter.—The market is dull and lower, with no improvement in the situation. In some quarters sellers are willing to shade quotations, while future business is also quiet and prices lower. The easing off in spelter is due to the anxiety of second-hands to sell. Spelter has declined 1c, and is quoted at 17c per pound.

Lead.—The market is featureless, and has a weaker tendency, although quotations are unchanged. Buying is light, consumers only covering for immediate requirements.. The Trust price is unchanged at 7c New York, but the outside market is a shade lower. Local quotations are unchanged at 9c per pound.

Antimony.—The market is unsettled and lower, but sellers are endeavoring to maintain prices. No future business is offered owing to the uncertainty of the market. Quotations have declined 2c, and are entirely nominal at 33c per pound.

Aluminum. — The market continues strong, due to heavy demand, which will take care of the entire production. Quotations are firm and unchanged at 65c per pound.

Solders.—The expected decline in solders has materialized, due to the lower prices of tin and lead. A fair demand is reported locally. Guaranteed is now quoted at 29c, and strictly at 28½c per pound.

DOMINION STEEL CORPORATION RECORD

IN keeping with the record-breaking statements that have been coming forward from the steel industry all over this continent, Dominion Steel Corporation reports for the year ended March 31 last the largest profits in its history, net manufacturing earnings rising to $7,004,316, an increase of $3,433,258, or 97 per cent. over the previous year, and an increase over the banner year of 1912-13.

Records in Output

Dealing with the year's operations, Mr. Workman, the president, reviews the difficulties encountered in the coal trade as a result of the shortage of ships and the drain on men resulting from the recruiting campaign. As to the latter, he says that representations were finally made to the Government and in view of the fact that a sufficient supply of coal and steel "is as important as the enlistment of men, orders were issued to discontinue recruiting in and about the collieries. It is estimated that upwards of three thousand men left the collieries and steel works to serve in the Allied armies, the collieries contributing the larger proportion. Vacancies at the steel works have been filled from various sources, and so far there has been no diminution of output."

After dealing with the wage adjustment of January and the recent general advance of 10 per cent., the president gives the production figures for the year. The coal output was 5,261,198 tons, against 4,550,512 the previous year, and 5,051,603 in the active year of 1912-13. Last year's requirements of coal for the steel works amounted to about 400,000 tons more than the previous year.

The tonnage of pig iron produced—329,664 tons, against 187,262 in 1914-15, was slightly less than in 1913-14, when the output was 333,919. The year just past, however, holds the record for the largest production of steel ingots, the total having been 371,086 tons, against 243,313 the previous year. Comparisons of production for two years follow:

	Year ending March 31 1916.	1915.
Pig iron	329,664	187,262
Steel ingots	371,086	243,313
Blooms and billets for sale	142,282	38 231
Rails	35,197	99,929
Wire rods for sale	55,106	14,277
Bars	8,017	14,310
*Wire	36,058	27,175
Nails, etc.	19,262	11,679

*This includes wire used in manufacture of nails shown in next line.

Factor of War Orders

Discussing the general aspects of the year's business, Mr. Workman says: "The most important elements in the steel business continue to be those which have resulted from the war. One-fifth of the steel shipped from the works was in forms suitable for the manufacture of shells. One-half the total output was exported. The destination of the greater part of this was Great Britain or France, but considerable tonnages were sent to South Africa, Australia and United States. British consignments included many parcels for re-shipment to India and the Far East. The benzol works and the 16-inch mill referred to in last year's report were completed and have been kept steadily in operation."

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Magog, Que.—The Dominion Textile Co. will build an extension to the power plant at their mill here.

Beauharnois, Que.—The Howard Smith Paper Co. propose building an extension to their power plant.

Windsor, Ont.—J. G. Hussey, is in the market for tinsmithing tools and machines, also an 8ft. cornice brake.

Trenton, Ont.—The Canadian Sprayer Co. is contemplating the erection of a plant, to manufacture sprayers and gasoline engines.

Toronto, Ont.—The Harbor Commission, will commence at once the erection of a brick machine shop on the Don Division to cost $13,500.

Pembroke, Ont.—The Pembroke Electric Lighting Co. are having plans prepared for a sub-station by R. S. Kelsch, Power Building, Montreal.

Selkirk, Man.—Prof. R. C. Wallace, provincial mineralogist, has gone to the Rice Lake gold fields to make an inspection on behalf of the Government.

Toronto, Ont.—The Ideal Bread Co. propose to build a bakery at an estimated cost of $3,000. Bond & Smith are the architects.

Toronto, Ont. — The Harris Abattoir Co., has had plans prepared for the erection of an addition to its plant, to cost $50,000.

Welland, Ont.—It is understood here that the management of the Canada Foundries & Forgings Co. has under consideration further additions to its buildings and plant.

Lindsay, Ont.—Good progress is being made in the construction of the chemical plant for the Hodgson Chemical Co. Two brick ovens, steam boilers and stills have already been installed. The company will manufacture wood alcohol, acetate of lime and charcoal.

Wolfville, N.S.—Work has been started on the Bay of Fundy tide power project at Cape Split, N.S., by the Cape Split Development Co., of Wolfville. R. P. Clarkson, formerly an electrical expert for United States Government, in consultation with other eminent engineers, is directing the work. Power will be generated by means of the tidal currents for distribution throughout the district.

Exeter, Ont.—C. F. Smalley of the Smalley Mfg. Co., Manitouac, Wis., was in town last week with a view of starting a branch factory, in connection with the Connor Machine Co.

Hamilton, Ont.—Damage amounting to about $15,000 was done by fire on June 13, to the factory of Lumsden Bros., and also to the Jersey Cream Factory, owned by the same firm, and adjoining its other premises on Macnab Street North.

North Vancouver, B.C.—The Wallace Shipyards, have been awarded contracts for the construction of three steel vessels to cost $400,000. The company has purchased a site and will build a new plant, the contract for the first unit having been awarded to T. Allan of Lyon Valley.

Municipal

Moose Jaw, Sask.—The City Council, will spend $12,300 on extensions and the installation of new equipment in the power plant.

Winnipeg, Man.—The Board of Control have recommended the purchase of a motor to drive 5,000,000-gal. pump at the waterworks. W. P. Brereton is city engineer.

Kingston, Ont.—The ratepayers on June 19 voted to ratify an agreement for a supply of electrical power from J. M. Campbell at Kingston Mills to the Utilities Commission. From 300 to 600 horse-power is being secured at three-quarters of a cent per kilowatt hour.

Tenders

Parry Sound, Ont.—Tenders are being called for heating apparatus and electric wiring for a new public school. Full particulars may be obtained from Angus & Angus, North Bay, Ont.

Beeton, Ont.—Tenders will be received until June 30 for heating, ventilating and galvanized iron work for a new school building. Full information may be obtained from the architect, John Wilson, Collingwood, Ont.

Toronto.—Tenders will be received by the Board of Control, up to July 4, for the supply and delivery of one 8-in. water-meter. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont.—Tenders for extension to Front Street sub-station will be received until June 28. Plans, specifications and form of tender may be obtained at engineering office of the Toronto Electric Commission, corner Duncan and Nelson Streets.

Vancouver, B.C. — The undersigned will receive tenders up till June 28, for the purchase of the following lapwelded steel pipe, manufactured by the National Tube Co., Pittsburg, Pa.; 20,000 lin. feet 6-in., 45,000 lin. ft. 8-in., 10,000 lin. ft. 12-in. James Stuart, city purchasing agent.

Toronto, Ont.—Tenders will be received up to July 4 for the supply of one 3-h.p. motor, one 20-inch square base self-feed vertical drill with ¾-inch drill chuck and shafting. Samples of the several articles can be seen and forms of tender obtained upon application at the office of the Fire Department, Adelaide Street Fire Hall, Toronto.

Prince George, B.C. — Tenders for power plant equipment for the City of Prince George, B.C., will be received at the office of the city clerk, up to July 8, 1916. Specifications and instructions may be obtained at the office of the city clerk, or at the office of the consulting engineers, DuCane, Dutcher & Co., Rogers Bldg., Vancouver, B.C.

The Pas, Man.—Tenders, addressed to H. H. Elliott, M.D., secretary-treasurer of the town of The Pas, Man., will be received up to June 22 for the supply and delivery of the following machinery and materials:—Tender "A"—For the supply and delivery of two sewage lift pumps. Tender "B"—For the construction of a sewage lift chamber. Plans and specifications may be seen at the office of Murphy & Underwood, consulting engineers, Saskatoon, Sask., and the resident engineer, The Pas, Man.

Ottawa, Ont.—Tenders will be received until July 10 for 163,500 lbs. of galvanized iron telegraph wire, delivered at Montreal, Que.; or 128,500 lbs. of same delivered at Kamloops, B.C., and 35,000 lbs. delivered at Vancouver, B.C.; early dates of delivery desired. Specification and forms of tender can be obtained on application to the office of the General Superintendent of the Govern-

ment Telegraph Service at the Department of Public Works, Ottawa; also at the office of J. T. Phelan, superintendent of Government Telegraphs at Vancouver, B.C.

Toronto, Ont.—Tenders for Examining Warehouse will be received until July 17. Plans, specification and form of contract can be seen and forms of tender obtained at the offices of Thos. A. Hastings, Clerk of Works, Postal Station "F," Yonge Street, Toronto, Ont., R. L. Deschamps, Central Postoffice, Montreal P.O., and at the Dept. of Public Works, Ottawa .

London, Ont.—By direction of the Honorable the Minister of Militia and Defence, the following old stores at the Ordnance Depot, London, Ont., are for sale by public tender: Leather, old 830 lbs.; old brass, 190 lbs.; old copper, 84 lbs.; old iron, cast, 628 lbs.; old iron, wrought, 57 lbs.; old steel scrap, 734 lbs. These articles may be seen on application to the Senior Ordance Officer, London, Ont. Sealed tenders for the purchase of all or any of these lots will be received until July 1, 1916.

Ottawa, Ont.—Tenders will be received up to July 4 for the construction of reinforced concrete foundations on wood piles or concrete piles, for 1,000,000 bushel storage capacity grain elevator, working house and track shed at Transcona, Man., separate tenders to be submitted for the foundations with concrete piles and foundations with wooden piles, and tenders may be submitted on either or both designs. Plans, specifications, etc., may be seen at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa; at the office of the Chief Engineer, Moncton, N.B.; at the office of the General Superintendent, Winnipeg, Man.; at the office of the Resident Engineer, Fort William, Ont.; and at the office of the J. S. Metcalf Co., Ltd., engineers, Montreal, P.Q.

Contracts Awarded

Galt, Ont.—The Bell Telephone Co., have let a contract to P. H. Secord and Sons, Brantford, for the construction of their new exchange.

Longueuil, Que. — Armstrong-Whitworth of Canada have awarded the contract for the addition to their plant to the Dominion Bridge Co. The Morgan Engineering Co., Alliance, Ohio, will supply the machinery for the rolling mills.

Fredericton, N.B.—The Provincial Government have awarded two contracts to W. R. Fawcett, of Temperance Vale, York County. One of the contracts is for St. Nicholas River Mouth Bridge, in Kent County. This is to be a structure of three covered spans, each 160 feet long. The contract price is about $30,000. The other contract is for two bridges, known as Upper Sackville and Anderson Bridges, in Westmoreland County. The contract price for the combined work is about $11,500.

Personal

Joseph T. Rolph, founder of the firm of Rolph & Clark, lithographers and engravers, Toronto, died on June 13, aged 84.

S. H. Reynolds, chairman of the Greater Winnipeg Water District Commissioners, died suddenly in Chicago on June 16.

L. T. Walls, Winnipeg, has resigned from the sales staff of the Steel Company of Canada, and joined the Manitoba Rolling Mill Co., Winnipeg.

H. S. Crowell, manager of New Burrell-Johnson Iron Co., Yarmouth, N.S., has been elected to the executive of the Canadian Manufacturers' Association.

H. J. Fuller, president, and **T. McMillan,** vice-president of the Canadian Fairbanks-Morse Co., and **C. H. Morse,** president of the Fairbanks-Morse Co., Chicago, were in Toronto last week inspecting the local plant.

Col. Thomas Cantley, president of the Nova Scotia Steel & Coal Co., and chairman of the Munitions Resources Commission, has been elected president of the Canadian Manufacturers' Association for the ensuing year.

James M. Nelson, who recently resigned as superintendent of the openhearth department of the Carnegie Steel Co. Works at Youngstown, Ohio, has been appointed superintendent of the open-hearth and duplex steel departments of the Algoma Steel Corporation at Sault Ste. Marie. Ont. He has had over 20 years' experience as a foreman and superintendent. At Sault Ste. Marie he will be associated with Lawrence H. Cooney, general superintendent of the Algoma properties, formerly a Youngstown man.

Wood-Working

Moncton, N.B.—Tuttle's lumber mill, was burned down on June 11. The loss is estimated at $5,000 with no insurance.

Brockville, Ont.—Fire in the planing mill of the McLaren Co. did considerable damage on June 14, which is only partially covered by insurance.

Marine

Thomas Muir Nairn, for many years superintendent of the Donaldson Steamship Line, died at his home, Notre Dame de Grace, Montreal, on June 6.

"Keewatin" to New Orleans.—It is reported that the Keewatin, which has been engaged for many years bringing coal from Oswego to Belleville, is to be taken to New Orleans, where it will be used in trade around the river and gulf.

"City of Midland" Raised.—The hull of the steamer City of Midland, which was burned last March and sank alongside the G. T. R. wharf at Collingwood, Ont., was successfully floated on June 10. It now lies by the drydock, where temporary repairs will be made, preparatory to remodelling into a tow barge or scow.

Steamship Directors Elected.—At a recent special meeting of the shareholders of the St. Lawrence & Chicago Steam Navigation Co., the following Board of Directors was elected:—James Carruthers, J. W. Norcross and Horace Smith, of Montreal; M. J. Haney, J. H. G. Hagarty, Aemilius Jarvis and A. A. Wright, of Toronto; J. P. Steadman, of Hamilton. At a subsequent meeting of the new board, J. W. Norcross was elected president and M. J. Haney vice-president, succeeding W. D. Matthews and Sir Edmund Osler. James Carruthers is president of the Canada Steamship Lines, M. J. Haney vice-president, and Messrs. Steadman, Jarvis and Norcross are directors.

Trade Gossip

The St. Maurice Paper Co. have awarded the general contract for their new mill at Cap de la Madelaine to the George A. Fuller Co., Montreal.

John T. Wilson, Ltd., of Toronto have had their charter extended to carry on business as iron and brass founders, machinists and tool makers, etc.

Victoria, B.C.—The forest revenue for the province for the month of May was very satisfactory, amounting to $189,000, which is larger than for the same month of last year, and in excess of the figures for May, 1914.

The Siemens Co. of Canada have received a $21,000 order from the Dept. of Public Works, Ottawa, for 17¼ knots of deep sea type submarine cable for Government telegraphs.

Canadian Fairbanks-Morse Co. have been appointed agents for Canada by the American Spectacle Co. of New York, one of the largest makers of

THE A. R. WILLIAMS MACHINERY CO., LTD.

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

Canada's Leading Machinery House

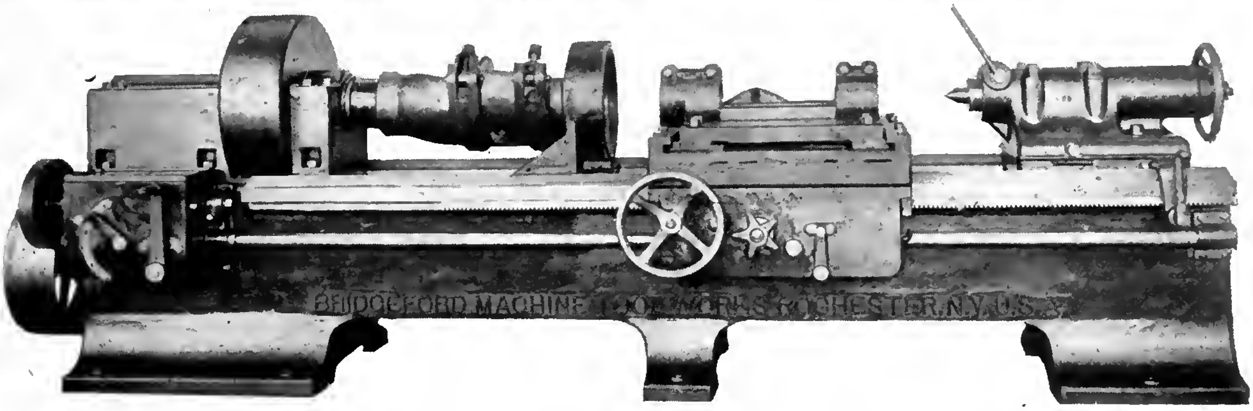
9.2 Shell Insert

Watch For It Next Week

"You Are Known by Your Products"

Link yourself up with Canada's Leading Shell Machinery House, profit by our experience in equipping munition factories and you will "produce a reputation" that will make you known as the Leading Shell House of Canada.

Next week's issue will contain a wide and exceptional collection of 8" and 9.2 shell machines. If you are unable to wait—write us immediately and we will send you advance information.



The Bridgeford Lathe illustrated here is typical of our high-grade machinery. It is arranged for boring (with special carriage for rough turning) and is a leader among the many first-class tools which we have investigated and can highly recommend for producing 8" and 9.2 high explosives. In selecting the tools for this class of work, we have kept before us our usual high standard of production, and our endorsement is backed up by our wide experience in equipping munition factories for the past eighteen months.

The A. R. Williams Machinery Co., Limited

64-66 FRONT STREET WEST :: :: :: TORONTO

If any advertisement interests you, tear it out now and place with letters to be answered.

workmen's spectacles and eye protectors in the United States.

Galt, Ont.—Geo. A. Dobbie, president of the Victoria Wheel Works and the Canadian Brass Co., and director of the Crown Hat Co., has acquired the interest of Andrew Newlands in the A. Newlands Co. and the Galt Robe Co.

The A. R. Williams Machinery Co., Toronto, have sold to the Western Machine Co., Port Arthur, Ont., a number of lathes, drills, cutting-off machines, boring machines, Beaudry hammers, furnaces, millers, and sand blast equipment.

Embargo on Feldspar.—The Dominion Government have placed an embargo on the export of feldspar. Considerable quantities of this material have for several years been shipped from the Kingston, Ont., district. The trade is valued at about $100,000 a year.

British Scrap Prices. — In a circular sent out through the Press Bureau, it is stated that the Ministry of Munitions are considering the question of fixing maximum prices for heavy steel melting scrap and for steel turnings and borings, and a notice accordingly may be expected in the London Gazette.

The General Car & Machinery Works of Montmagny, Que., have rebuilt their plant, which was recently damaged by fire. The plant consists of steel, iron and brass foundries, forging and machine shops, giving a total floor area of 117,000 sq. ft. A power plant has been installed having a capacity of 1,000 h.p.

Montreal, Que.—It is reported that the Canada Cement Co. has reopened its large cement plant at Exshaw, Alta., which employs about 300 men when working to capacity. It is probable that, owing to the increasing demand for the company's product in the West, the Calgary plant will be started up later on.

The Montreal Jeffery Sales Co., under the management of James L. Kreg, and with showrooms in the Forum Building, St. Catherine Street, Montreal, has been organized to represent the Thomas B. Jeffery Co., of Kenosha, Wis., manufacturers of Jeffery pleasure cars and trucks.

Toronto, Ont.—The movement for the establishment of an Industrial and Publicity Bureau for the city has been advanced by the appointment of a special committee of seven at the meeting held in the City Hall to formulate a definite scheme of organization for submission to a general meeting of citizens at a later date.

The New York & Ontario Power Co., a corporation organized under the laws of New York State, recently made application through Spratt & Van Kennen for permission from the war department to suspend an electric transmission line across the St. Lawrence River for the conveyance of electric current from Waddington to a point on the Ontario shore near Morrisburg.

The Toronto Pressed Brick Co., Milton, Ont., and the Medina Shale Brick Co., Streetsville, have amalgamated with the Milton Pressed Brick Co., Milton, Ont., and a company has been incorporated with a capital of $1,500,000. The head office will be at Milton, Ont. J. S. Cammell is president and managing director, and F. R. Connel is vice-president. The directors are P. Stillwaugh, J. McBain and W. D. Lumis.

Electric Vibrators made by The Magnetic Mfg. Co., Milwaukee, Wis., are described fully in bulletin No. 5. These electric vibrators are designed for foundry use and their construction and method of operation are dealt with at length. The various types are illustrated as are also the motors and attachments. A price list covers the complete line and also vibrator accessories.

The Jeffrey Manufacturing Co., of Columbus, Ohio, announce the reopening of their North-Western branch office at Seattle, Wash., and the appointment of Percy E. Wright, consulting mechanical engineer, as district manager for Oregon, Washington, Alaska, British Columbia, and Alberta. Mr. Wright, who has been in the North-West since 1910, and whose connection with the company dates back to 1902, has had a wide and varied experience and training in the handling of the Jeffrey line in the engineering, construction and sales departments.

The Roelofson Machine & Tool Co., Galt, Ont., are building a new plant, which will be equipped for making special machinery and small tools. The main building will be 182 ft. by 104 ft., one storey of brick and steel construction, and saw tooth roof. The plant will be driven throughout by Hydro-Electric power. The company, who have represented the Potter & Johnson Machine Co. of Pawtucket, R.I., for some considerable time, will make Galt a distributing point, and for this purpose will utilize part of the plant as a warehouse for machine tools.

Export Tonnage Increases.—In the matter of available tonnage for Canada's export trade there has been considerable improvement in the last couple of months, according to information received by the Marine Department. There is plenty of tonnage now for all the traffic offering, according to reports received in Ottawa. The substantial reduction in ocean freight rates since the opening of navigation on the St. Lawrance this spring is considered a corroboration of the improvement regarding available tonnage. The reduction in freight rates on the lakes has been slightly greater than that in the ocean rates.

Staff Changes.—A number of changes have recently been made in the management of the Manitoba Bridge & Iron Works, Winnipeg, Man., J. A. McCulloch, who has been sales manager for the past five or six years, has been appointed general superintendent with jurisdiction throughout the plant. Mr. McCulloch has bad a wide experience in the structural, mechanical and the sales end of the business. H. A. McKay, chief engineer, takes over supervision of the sales department, while still retaining oversight of the engineering side of the plant. Mr. McKay's connection with the Manitoba Bridge & Iron Works begain in 1908, prior to which he was in the engineering department of the C.N.R. at Toronto. E. Stewart, who has been acting general superintendent for the past few months, is still with the firm although in another capacity.

Building Notes

Montreal, Que.—The Keith Orpheum Co., will build a large theatre here which will have a seating capacity of 3,000. A site has been secured.

New Incorporations

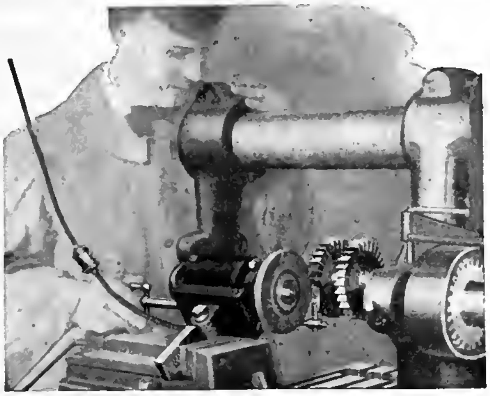
The Champion Ignition Co., has been incorporated at Toronto with a capital of $40,000 to manufacture electrical ignition equipment and electrical apparatus at Walkerville, Ont. Jos. W. Coatsworth of Walkerville is the attorney.

The Frontier Pulp and Paper Co., has been incorporated at Toronto with a capital of $50,000 to carry on a paper and pulpwood business at Thorold, Ont. Incorporators, M. D. Feigenhsohn, G. W. Knox and T. F. Battle all of Niagara Falls, N.Y.

Feldspars, Ltd., has been incorporated at Ottawa with a capital of $200,000 to develop, smelt and otherwise treat ores metals and minerals. Head office to be situated at Toronto, Ont. Incorporators, M. A. Richardson, A. C. Fleming and J. R. Cook all of Toronto.

The Auto-Knitter Hosiery Co., has been incorporated at Toronto with a capital of $40,000 to carry the business of knitters and cotton spinners, etc. Head office to be situated at Toronto. Incorporators, J. M. Bullen, J. H. Fraser and H. L. Steele all of Toronto.

Aikenhead's DUMORE GRINDER



SPEED

To do quick, accurate work, speed is absolutely necessary. If you are not giving your wheels the correct surface speed, they will break down, making it impossible to maintain accuracy. The DUMORE with 10,000 R.P.M. on the motor spindle, and 30,000 R.P.M. on the internal attachment, gives you a cutting speed that enables the wheels to clear themselves; and enables the operator to maintain size.

As the name implies, it will "DO MORE" than the ordinary Portable Grinder, and tool and die makers everywhere give it the preference. Try it and be convinced.

Aikenhead Hardware Limited
17, 19, 21 TEMPERANCE STREET
TORONTO - - - CANADA

O. K.

"Wish to say that in my estimation Geometric Tools are O.K."—J. W. D., Shop Foreman.

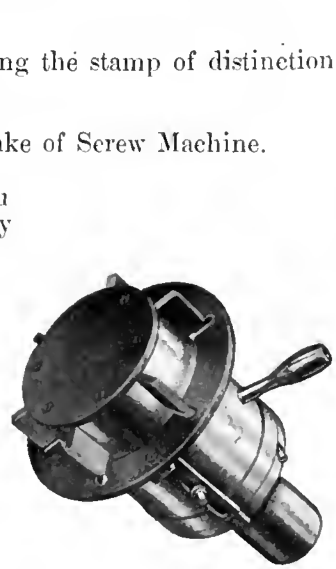
The opinion of this Shop Foreman is the opinion of all users of Geometric Screw-cutting Tools

Every Die Head and Collapsing Tap bearing the stamp of distinction —*"Geometric"*—has been tested by experts.

Can be arranged with shank to fit any make of Screw Machine.

Geometric Threading Tools will produce for you either external or internal screw threads of any diameter, length, pitch and form.

Make our acquaintance now, through our literature, and when you are ready to order, you will know just the tool needed. Tell us the class of thread-cutting that interests you, and we will send booklet describing tools to suit.



The Geometric Tool Company
NEW HAVEN, CONN.

Canadian Agents: Williams & Wilson, Ltd., Montreal. The A. R. Williams Mchy. Co., Ltd., Toronto, Winnipeg, St. John, N. B.

The Fegles-Bellows Engineering Co. has been incorporated at Ottawa with a capital of $100,000 to carry on the business of general contractors, and engineers. Head office to be situated at Winnipeg, Man. Incorporators, D. B. Fegles and W. S. Bellows, of Fort William, Ont.; and W. S. Whitney, of Winnipeg.

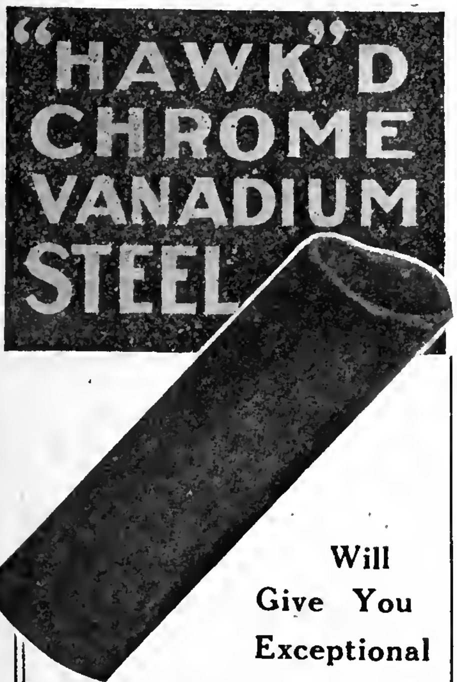
Catalogues

The Terry Steam Turbine Co., Hartford, Conn. have issued an informal booklet describing a combination of auxiliary machinery called the duplex exciter. It is claimed that for nearly all large steam generating stations these duplex exciter sets have shown some striking advantages over any other source of excitation.

Graphite for Cylinder Lubrication is the title of an attractive little booklet dealing with the above interesting subject and issued by the Joseph Dixon Crucible Co., Jersey City, N.J. The booklet tells of graphite lubrication for both steam and gas cylinders and also gives concise facts about lubricators that are made to use graphite alone or with oil.

Wiring Rules.—The seventh edition of "The Wiring Rules of the Institution of Electrical Engineers" has just been issued. The alterations that have been made are largely matters of detail, but the following points may be noted:—The clause relating to gas pipes is strengthened, and combined gas and electric fittings are not to be used. If gas fittings are adapted they must be entirely disconnected from the gas piping. The test for cables has been somewhat modified. A pressure of 1,000 volts for half an hour is stipulated for 250-volt cables, but this is increased to 2,500 volts for 650-volt cables. These grades of cable are defined by the radial thickness of dielectric and the insulation resistance. The testing current is to be alternating at a frequency of 50-100, and the alternator must have an output of not less than 5 kilowatts. Some modification has been made in the specification of flexibles, and bunching in wood casing is allowed to a larger extent. As regards lead-covered conductors, these must be exposed to view; but it is not clear whether this clause covers Henley's special system. Switches having handles projecting from an open slot in the cover are now barred. Definite distinguishing colors are recommended for positive, negative and neutral conductors, and for three-phase conductors.

The Trill Indicator Co., of Corry, Pa., has issued a new 56-page, complete and up-to-date publication on engine indi-



cators and indicating. The book is copiously illustrated and describes in detail the construction and purpose of the several parts of both the outside and enclosed spring types of indicators, including indicator reducing motion. Considerable space is given to discussion and data on indicator springs and full instructions on indicating and interpreting cards from all types of engines, high pressure steam, gas and fuel oil engines, triple-expansion and compound engines and ammonia compressors. Detailed instructions are given on the application and use of the indicator and the planimeter, with easily understandable instruction on the few arithmetical calculations that are necessary. There are 15 pages illustrating and discussing the characteristic diagrams of the several types of engines, including the latest four-valve engines of the new poppet valve type, the Uniflow engine, high compression two-cycle oil engine and the Diesel engine, also a large number of faulty diagrams, illustrating the common faults of engines. A copy of the book will be sent upon request.

Book Reviews

Patent Protection is the title of a book published by Babcock & Sons, Montreal, Que. An alternative title for this publication is Babcock's Book for Inventors. It is an explanatory statement and guide for clients and others interested in Canadian, United States, and Foreign patents, trade marks, copyrights and similar exclusive privileges. The book contains a great deal of useful information for prospective inventors, etc., and will serve as a medium for obtaining information as a preliminary to taking out a patent. It contains 86 pages and is bound in cloth covers.

The Shipping World Year Book, 2,010 pages $7\frac{1}{4}$ in. x $4\frac{1}{2}$ in., edited by Major E. R. Jones, and published from the "Shipping World" offices, London, England. Price 11s. ($2.75) net. The 1916 or thirtieth edition of this year book contains, as in former years, much valuable information for all interested in shipping. It is a very useful publication for shippers and merchants trading in all parts of the world, and is also a very handy book of reference as the information given covers a wide field. The war has of necessity made the compilation of this work no easy task, as it has effected profoundly the commercial and shipping interests everywhere. This circumstance, however, has not detracted materially from the value of the book, as it has been brought up-to-date as far as possible

from available data. The book is arranged in three sections. the first or general section deals principally with matters affecting navigation and shipping contains a digest of merchant shipping acts, alien and factory acts, customs regulations, etc., also numerous tables embodying much valuable information. This section has been revised and some pages rewritten owing to restrictions imposed by the war, while new features have been added to bring the matter up to date. The second section is devoted to a port and harbor directory of the British Isles, the Overseas Dominions and Foreign Countries. The geographical location of each port is given, together with particulars regarding water levels, anchorages, harbor dues, port officials, etc. The third section gives the customs tariffs of all nations brought up-to-date as far as possible under the present conditions. The tariffs of enemy countries have of necessity been left as they were in the 1915 edition, but considerable changes have been made in the Australian tariff, and also in that of the United Kingdom, the latter being entirely a war emergency measure. There is also a new map of the world showing trade routes, ports and coaling stations, etc. The book is of particular value now in view of the proposals which have been made to develop trade within the Empire and with our Allies. It is printed in clear type, has a very complete index, and is bound in substantial green cloth covers.

TRADE WITH BRITAIN

THE following is a return of trade between Great Britain and Canada in the articles mentioned, during May:—

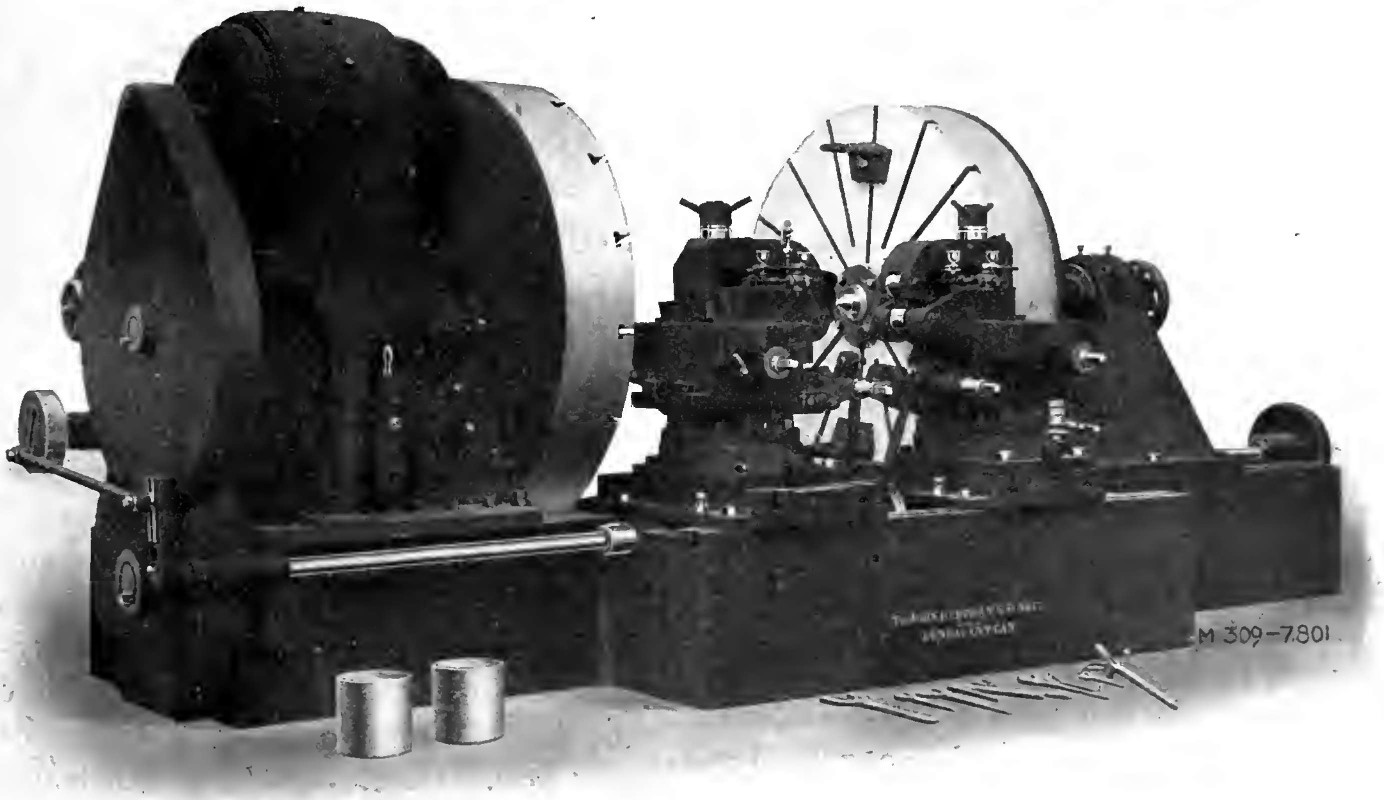
Exports from Canada

	May, 1915. £	May, 1916. £
Wheat	467,955	1,447,994
Wheatmeal	238,852	493,965
Barley	3,900	84,910
Oats	1,602	3,065
Bacon	227,684	955,532
Hams	11,702	31,567
Cheese	80,078	228,211
Eggs	2,126	10,119
Canned Salmon	126,934	225,362
Canned lobsters	26,190	21,609
Fir	166,506	198,258

Imports to Canada

Spirits	33,548	47,650
Wool	13,759	25,733
Pig iron	605	36,472
Galvanized sheets	31,126	
Steel bars	7,311	16,807
Pig lead	1,366	9,837
Tin unwrought	21,522	24,163
Cutlery	3,760	6,262
Hardware	4,623	4,750

BERTRAM MACHINE TOOLS



80-in. Motor-Driven Extra Heavy Driving Wheel Chucking Lathe

One of our large line of heavy tools for Locomotive and Car Shops. Equipped with Teas Patent Sure-Grip Drivers and Pneumatic Tool Clamps. Movement of tail stocks by motor.

Drop us a line for full particulars.

The John Bertram & Sons Co., Ltd.

Dundas, Ontario, Canada

MONTREAL 723 Drummond Bldg.	VANCOUVER 609 Bank of Ottawa Bldg.	WINNIPEG 1205 McArthur Bldg.

The Publisher's Page

A Request to Advertisers

IN order that we may render to our advertisers the best possible service, to insure change of advertisement and to guarantee insertion in any particular issue, it will be necessary to furnish copy much earlier than formerly.

CANADIAN MACHINERY has doubled in size during the past year. Its growth has been phenomenal. The work in connection with its publication has greatly increased. The number of "forms" and the number of press runs has been doubled. Naturally more time is required.

We invite the co-operation of our advertisers and shall appreciate it if copy and cuts are placed in our hands just as far in advance of the date of issue as possible.

Forms close one week in advance of issue, so that in order that proofs may be submitted and returned to us for correction, it will be necessary that copy and cuts be in our possession a full two weeks before the advertisement is scheduled to appear. Two weeks should be the inside limit, to insure the best of attention. Three weeks would be better and four weeks better still.

Copy for front cover advertisements, especially when cuts are to be made, should be supplied at least three weeks in advance.

Advertisers desiring to use larger space than usual will confer a favor if they will advise us as far in advance as possible in order that suitable position may be reserved.

Canadian Machinery & Manufacturing News

143-153 University Avenue, Toronto, Canada

A convenient type of Crawford Sectional Oven largely used by manufacturers turning out Shells up to twenty-eight pounds each.

The method of heating explained in previous issues is the same with all types of Crawford Ovens—no direct flame coming in contact with the material in the oven.

Either city, natural, gasoline or producer gas can be used with either type of oven.

Ovens and trucks built for baking the varnish or finish on any number or size of shells required at a time.

The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN., U.S.A.

Canadian Representatives: THE A. R. WILLIAMS MACHINERY COMPANY, LIMITED, TORONTO, CANADA

BAND TURNING MACHINE

6-Inch Band Turning Machine.

Machines for 15, 18, 60-pdr. and 4.5 and 6-inch Shells.

The **experienced** shell maker will appreciate the design of this most efficient machine. The following features are worthy of special note.

Integral (en bloc) construction insures perfect **rigidity**, permanent **accuracy** and desirable **compactness**.

Self-centering cup rest with push collet chuck provides automatic location of work, accurately and rapidly.

Graduated feed dial, two cutting tools and ample belt power insure maximum output of accurate work in least possible time.

Many in use in Canadian Munition Plants giving absolute satisfaction.

WRITE FOR PRICES AND DELIVERIES.

ROELOFSON MACHINE & TOOL CO., LTD.

Head Office: 1501 Royal Bank Building, TORONTO, CANADA

Works: GALT, ONT., CANADA

GARLOCK-WALKER MACHINERY CO.
LIMITED

32 FRONT ST. WEST, **TORONTO** TELEPHONE MAIN 5346

Heavy Machine Tools for
8-inch, 9.2-inch and 12-inch Shells

18" and 20" Engine Lathes for Tool Room Equipment.

Single Purpose Turret and Turning Lathes for 6" Shells and under.

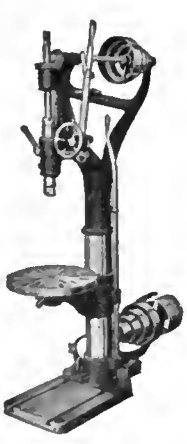
Write us for prices and deliveries on anything in the way of Iron or Wood Working Tools.

GARLOCK-WALKER MACHINERY CO., Limited, Telephone Main 5346 **32 Front St. West, TORONTO**

Canadian Representatives for: American Wood Working Machinery Co., Rochester, N.Y.
Lodge & Shipley Mach. Tool Co., Cincinnati, Ohio. M. L. Andrews Co., Cincinnati, Ohio.

METAL and WOODWORKING MACHINERY of all Kinds

The BARNES DRILLS



Complete line. 8-inch to 50-inch swing

Gang Drills.—Horizontal Drills.

SEND FOR CATALOG.

W. F. & JOHN BARNES CO.

104 Ruby Street - ROCKFORD, ILL.

Canadian Agents—A. R. WILLIAMS MACHINERY CO. Toronto, Winnipeg, Vancouver, and St. John, N.B.
WILLIAMS & WILSON, Montreal

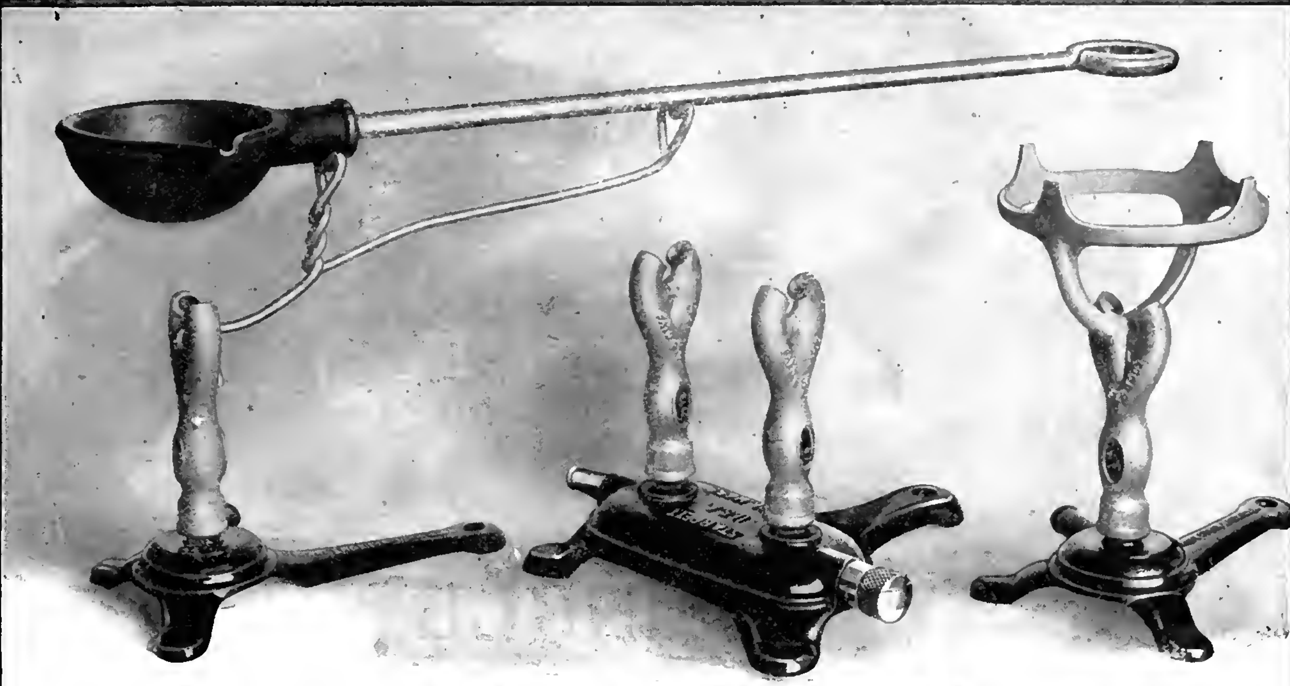
Motor Driven Speed Lathe

This style of motor drive employs a constant speed motor mounted on a plate having an extension arm to support a bearing for the outer end of the motor shaft. The motor plate is fitted to a slide on a shelf which is securely fastened to the back of the lathe bed. The motor plate is moved by means of a screw which tightens or loosens the belt. A four-step cone pulley on the motor shaft is belted to a four-step cone pulley on the spindle. This gives the same speed variation as when a countershaft is used, and by means of various size cones on the motor a wide range of speeds are obtainable.

The lathe spindle is made from high carbon steel, ground to size, and running in self-oiling bronze bearings. The tailstock has screw and lever feed. The bed is crossed-braced and all clamping levers are above the ways.

J. G. BLOUNT CO. - Everett, Mass., U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.



Starrett Twin Gas Heater

TRADE MARK REG. U.S. PAT. OFF.

THIS HEATER is very efficient in the machine shop, especially in the tool-room, for tempering small tools, melting lead, babbitt, etc., and as a forge for light work. You will also find this heater extremely handy, useful and economical in your home. For laboratory work and wherever a blue-flame burner is required the Starrett Twin Gas Heater has no equal.

Its effectiveness lies in its scientific construction. The gas and air is thoroughly mixed for perfect combustion while passing through the deflectors in base of tubes. The tubes cause the flames to penetrate each other at cross-angles, thus producing an intense heat, free from smoke and with no waste of gas.

RETAIL PRICES

No. 100A	Burner only, without base	$0.75
No. 100B	One Burner with base	1.00
No. 100C	Two Burners with base	2.00
No. 100D	Three Burners with base	3.00
No. 100E	Tool Holder only .	.15
No. 100F	Dish Holder . .	.25
No. 100G	Ladle only . .	.25
No. 100H	One Burner with Base, Tool Holder and Dish Holder . . .	1.40

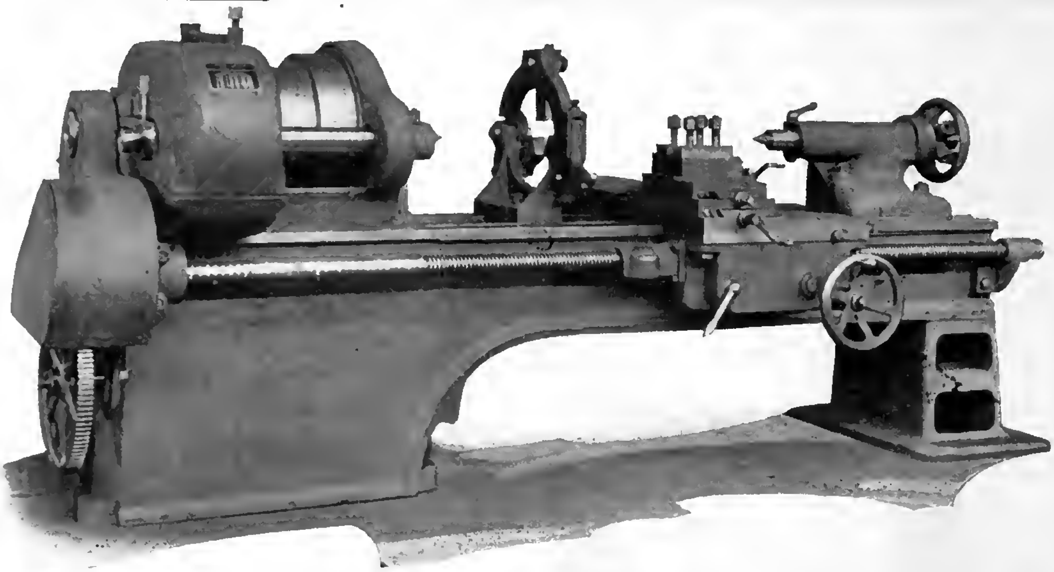
For sale at leading Hardware Stores
Send for Free Starrett Catalog No. 21-3

STARRETT TOOLS TRADE MARK REG. U.S. PAT. OFF.

The L. S. Starrett Co., Athol, Mass.

"The World's Greatest Tool Makers"

London New York Chicago



LANG SINGLE PURPOSE LATHE

Made in United States under supervision of British Government (Lang's Design).
For reducing weight on 9.2 shells. EARLY DELIVERY.

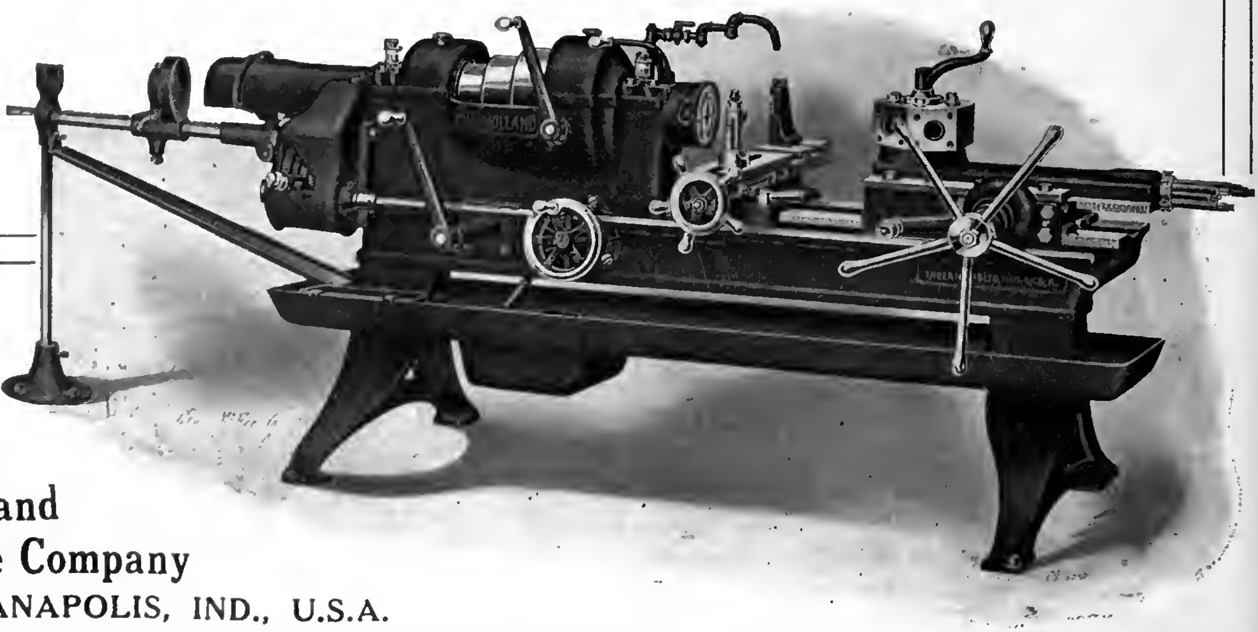
59 BEAVER HALL HILL **PEACOCK BROTHERS** MONTREAL QUE.

Millholland $1\frac{5}{8}$ x 10 Turret Screw Machine

The combined result of two generations of engineering and mechanical experience. While, as a whole, it is no radical departure from established lines of the turret lathe, it has many **original features**, and with these features are combined well-known devices.

Safety, rigidity, convenience, production and durability are the ideas behind every step in their construction.

Your request will get you full details and specifications by early mail. Make it.

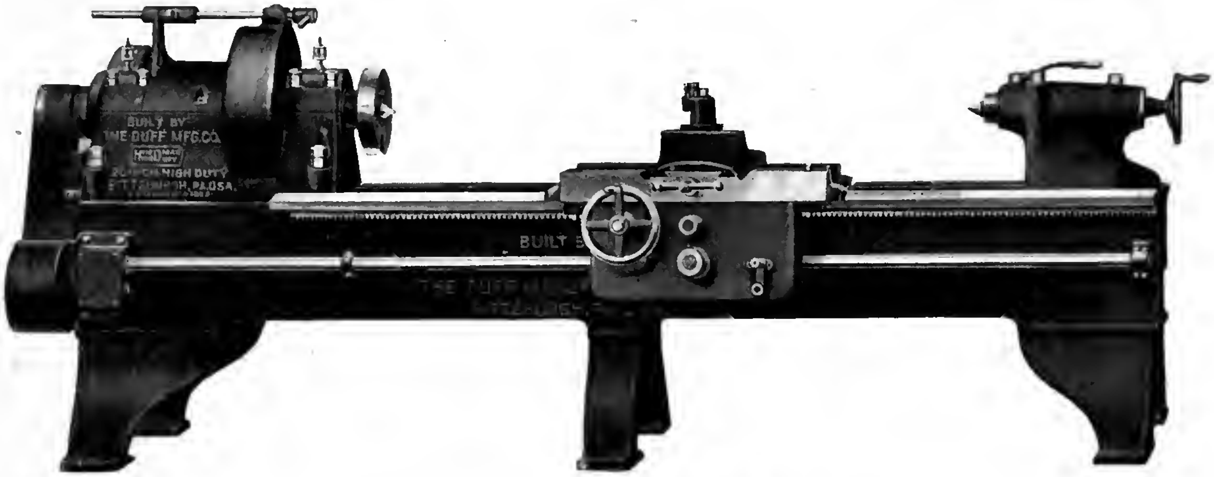


W. K. Millholland Machine Company

INDIANAPOLIS, IND., U.S.A.

Heavy Turning of Duplicate Parts

For this type of work the requisite features are Power and Accuracy. You will find more than the required degree of both features in this machine.



THE HINDMAN
20-in. High Duty Lathe

Here is a machine of 20-in. swing, delivering the power of a 36-in. lathe. Note the compactness; the simple, yet rugged, construction. Study the specifications. Then you will realize the power of this lathe, it develops 15-hp. at the cutting tool.

OUR BULLETIN WILL GIVE YOU COMPLETE DATA.

We Can Make Immediate Deliveries on 10-ft. bed lathes.

Write or Wire at Once.

Detailed Specifications

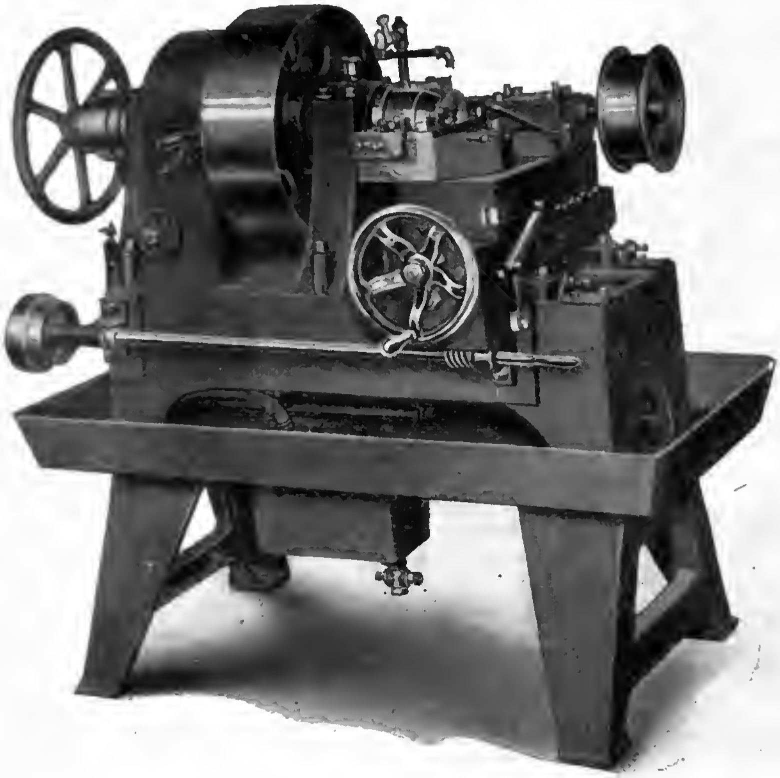
Swing over Shears	20"
Swing over Carriage	12"
Distance between Centers, 10' Bed	64"
Single Speed Drive, consisting of tight and loose pulley, loose pulley running on roller bearings. Speed of 690 revolutions per minute, diameter of pulley	10½"
Width of belt	4½"
Front Spindle Bearing diameter	5 "
Front Spindle Bearing Length	7⅝"
Spindle Nose Diameter	4 1/16"
Spindle size of hole, regular (up to 3½" extra)	1½"
Diameter Main Driving Gear (Steel) on Spindle	18 x 3 11/16" Face
Spindle Speeds (Steel Gears, 3" Face) number regularly furnished	3
Feeds number, regularly furnished	5
Feeds range	20 to 100
Tail Stock Spindle	3½" dia.
Tail Stock Spindle travel	6"
Width of Bridge	10"
Carriage arranged to take any form of multiple tool holder.	
Bed arranged to take any design of taper attachment, and also for back facing arm.	
All Gears of Steel. High-Speed Gears carbonized and hardened. High-Speed Pinion on pulley shaft is Vanadium Steel, hardened and ground.	
Weight, 10-ft. bed, approximate	6,000 lbs.

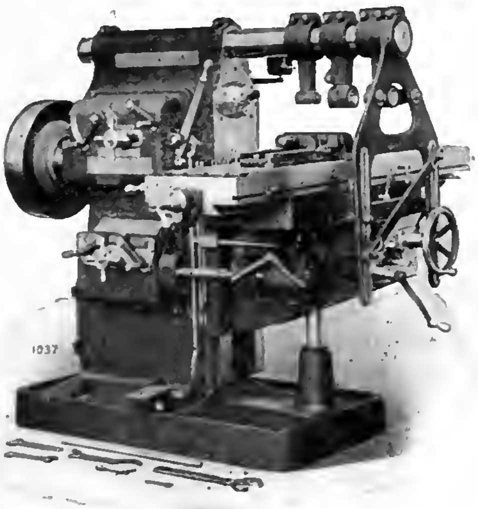
The Duff Manufacturing Co.

ESTABLISHED 1883

Pittsburgh, Pa., U. S. A.

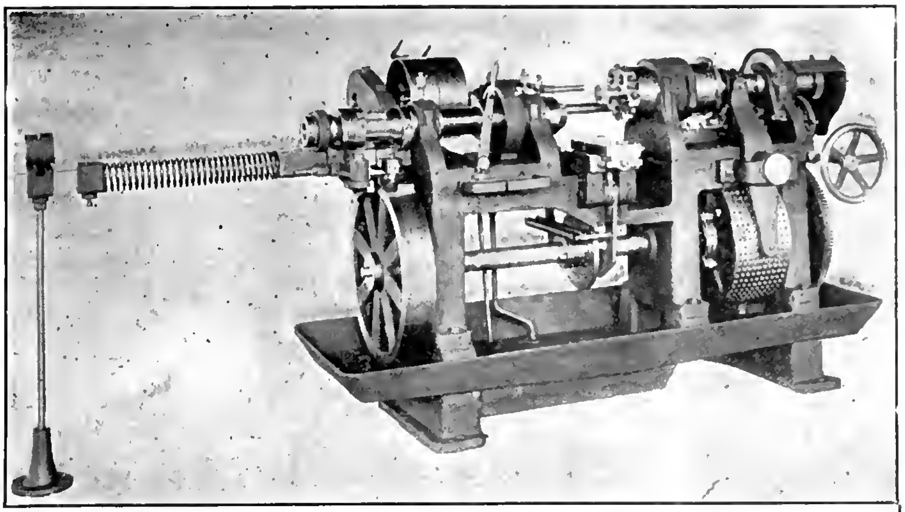
NEW YORK CHICAGO





One of our 9 High Power Single Pulley Plain Millers. We also make 9 cone driven plain machines.

The Chicago Automatic Screw Machine



MANUFACTURES RAPIDLY AND ACCURATELY WITHOUT THE USE OF A COMPLICATED MECHANISM OR A SYSTEM OF CAMS THAT ARE DIFFICULT TO DETERMINE AND ARRANGE ON THE MACHINE. The rigidity of the machine has not been sacrificed for the flexible features which are embodied in the Chicago Automatic. Alignment is correct and there are no parts where excessive wear takes place—therefore accurate production is assured during the long life of the machine.

No countershaft is required—the machine is quipped with a fast and loose pulley on the spindle head, this being the only belt drive on the machine.

Spindle speeds suitable to different sizes and kinds of stock within the capacity of the machine are obtained by changing two gears on the spindle head.

IN LESS THAN SIX WEEKS AFTER YOUR ORDER REACHES US WE CAN PLACE CHICAGOS IN YOUR PLANT READY FOR PRODUCTION.

Chicago Automatic Screw Machines are not an experiment—ten years of intensive manufacture of one product—Automatics—stands behind every machine.

Full particulars on request.

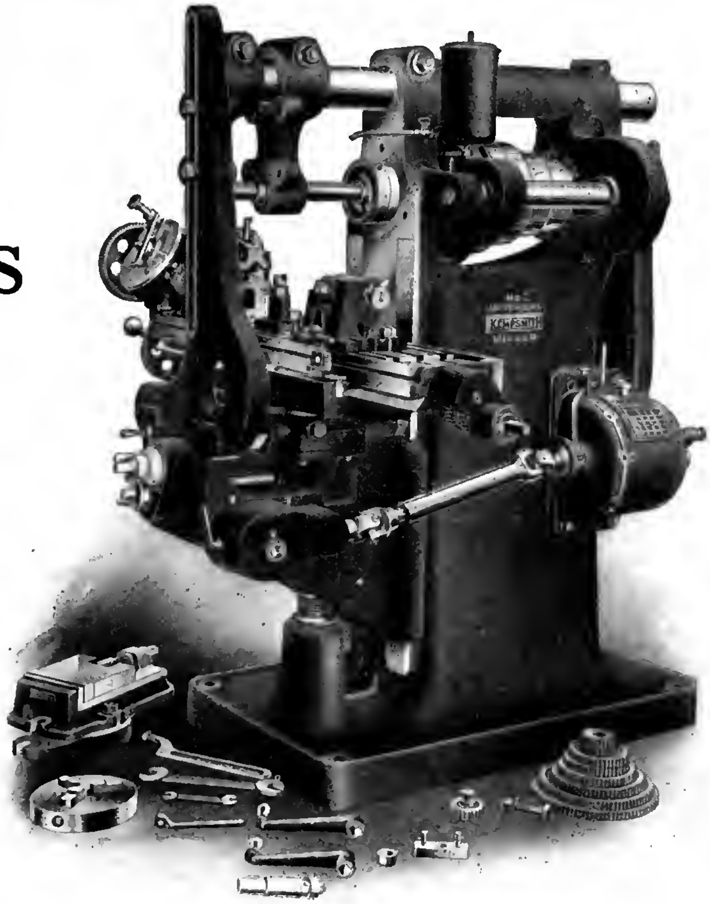
THE JOHN McNAB MACHINERY COMPANY

NEW YORK CITY, U.S.A.

European Representatives : John McNab, Hyde, England.

KEMPSMITH

UNIVERSAL MILLING MACHINES



Are built in three standard sizes. They embody every worth-while feature to be found on a tool room Milling Machine.

We call especial attention to the Dividing Head which is part of the regular equipment of every Universal Miller.

The Kempsmith Dividing Head is compact and rigid, unusually convenient in operation and so constructed as to maintain its accuracy under heavy service.

We publish a thirty-two page book elaborately illustrating and describing this Dividing Head. A copy will be sent free on request. Just ask for "Dividing Head Book."

Kempsmith Manufacturing Co.

MILWAUKEE, U. S. A.

Agents:—Foss & Hill Machinery Co., Montreal
General Supply Company, Toronto and Ottawa
Western Supply and Equipment Co., Calgary

The *Greenfield*

For Special Work, Tools, Jigs, Etc.

This Universal Grinder is just the machine needed in many of the shops engaged in equipping for the manufacture of special lines. It is an all-around grinder and will handle about any kind of a job that comes within its range.

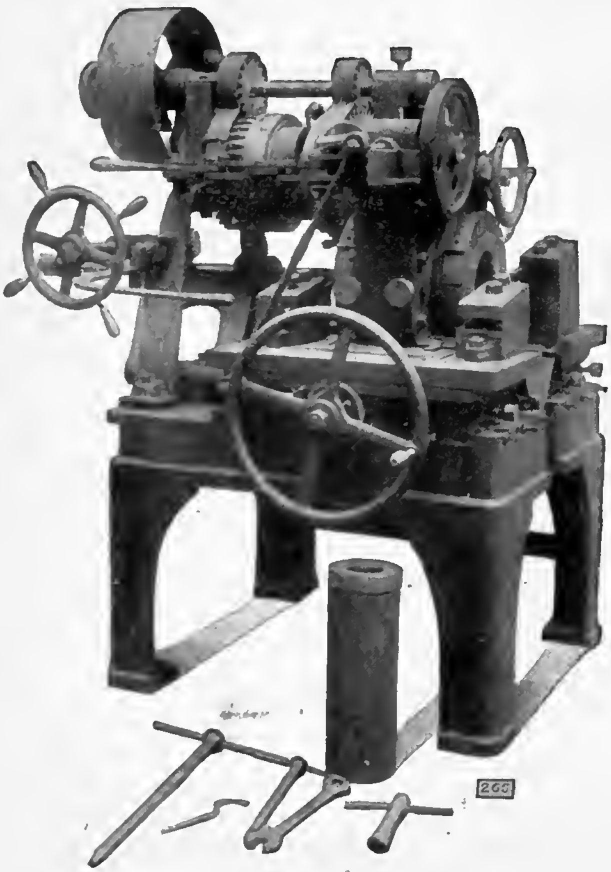
It has a stiffer, more rigidly supported table than any similar machine. It will turn out accurate, dependable work. Also, we believe we are perfectly correct in stating that we furnish this machine with a larger and more complete set of attachments than can be had for any grinder selling at anything like the same price.

How can we do it? Specialization and building in quantities.

Ask for Catalog No. 5, showing the machine in twenty-one different "set-ups" and explaining the purpose of each.

Greenfield Machine Company

Greenfield, Mass., U.S.A.



CUTTING-OFF MACHINES

Quick Delivery

For cutting off and trimming 18 pr. to 9.2" Shell Ingots and Forgings.

Cut shows 6" machine as arranged for cutting off both ends of 6" forging at once, using four tools.
Floor space approximately 4 ft. x 5 ft.
Two speeds with instantaneous change.
Will cut crooked and short Ingots.
No loose collars to put on Billets.
One helper to every three or four machines.

THE

Wm. Kennedy & Sons
LIMITED

OWEN SOUND, CANADA

Canadian Sales Agents
THE W. W. BUTLER CO., Limited, Transportation Building, Montreal

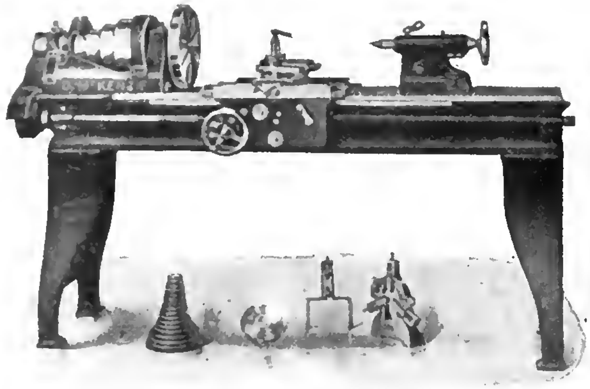
MADE IN CANADA

The Improved Power Hack Saw

will cover its cost many times over with the money it saves through long, efficient service.

Saws bars 6 x 6 in., either round or square, and is so constructed as to require no attention after work is put in vise, and stops automatically when piece is cut off.

The Improved Saw Guide is a Special Feature — it keeps the saw perfectly in line at all times.



The "McKenzie" Engine Lathe

The Standard of Accuracy

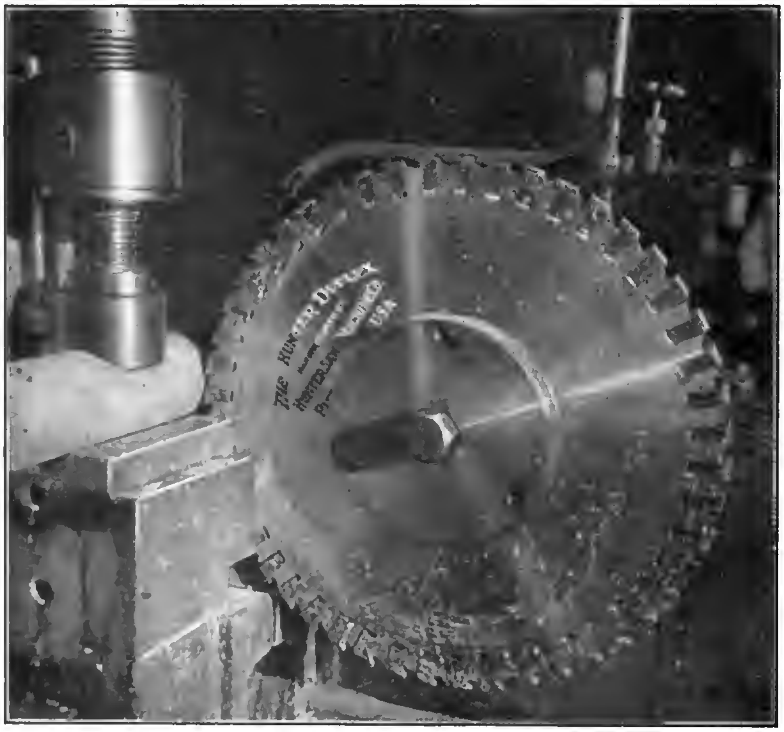
Made from new patterns, of improved design, and constructed of the very best material by expert workmen. Every part is mechanically perfect and excellently finished.

Its accuracy and durability mean a big saving of money to you.

Let us put full details before you. Write!

The D. McKenzie Machinery Co.
GUELPH, ONTARIO

A Hunter "Duplex" on Shrapnel Stock



FAST GOING
on Newton Machine

Through 3½" round 60 Carbon, 70 Manganese Shrapnel Stock every

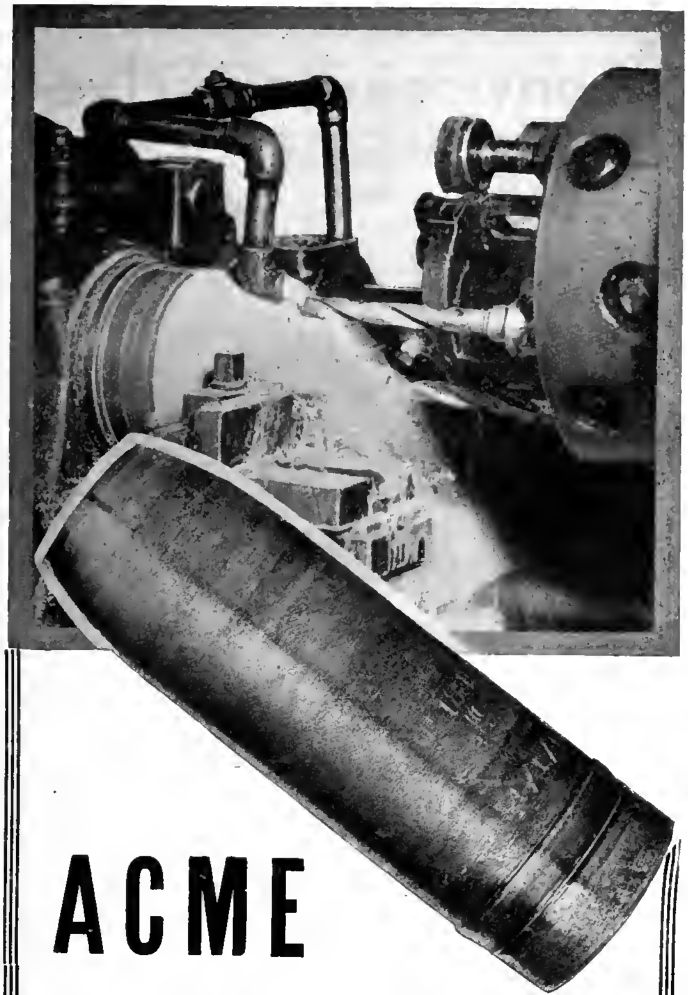
2 MINUTES

The secret of Hunter "Duplex" Saw speed is the method of holding the high speed teeth.

You can use this speed profitably—on shrapnel or any other stock.

Let us send full Particulars.

HUNTER SAW & MACHINE COMPANY, Pittsburg, Pa.



ACME

Cutting Lubricant used on Shrapnel Shells

Keeps the tools clean and cool and increases production.

"Acme" is a free, unsaponified, animal oil lubricant, which will not separate in solution, gum machines or rust the work.

"Acme" will not clog pipes or stick to the finished work as oil does. Has a clean, wholesome smell.

Leading manufacturers use it on shell work in preference to oil; costs less, increases production.

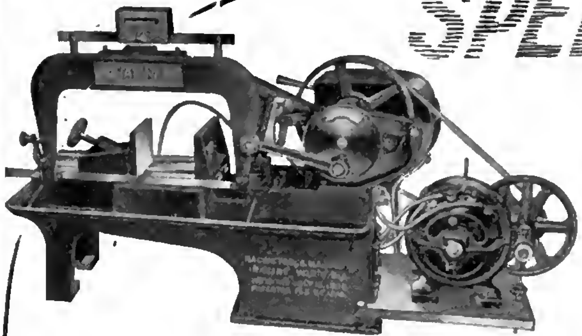
Use it on your Gear Hobbers, Milling Machines, Turret Lathes and Automatics.

We solicit your trial order and will ship on thirty days' approval, subject to practical test.

Cataract Refining Co., Limited

TORONTO, ONTARIO

SPEED



and a clean, straight cut

If you're interested in speed and accuracy you'll be interested in the

Racine Metal Cutter

It goes through angle irons, channels, I-beams, die blocks, pipe, tubing, heavy bars, etc., in a way that wins the enthusiastic endorsement of all users. It is in use in many Canadian shops. One Canadian Steel Company purchased 120 Racine Metal Cutters and has effected a saving of $11,019.50, full particulars of which will be given interested parties.

Write for list of Canadian users, and specifications.

Racine Tool & Machine Co.

15 Melbourne Ave., Racine, Wisconsin, U.S.A.

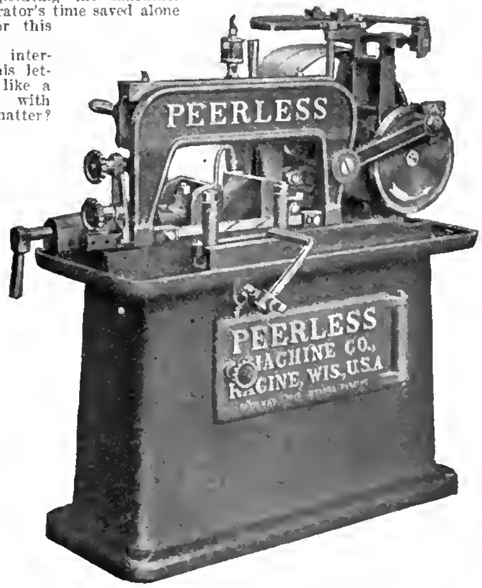
Are You Behind on Cutting Your Steel?

then read these two paragraphs from a customer's letter. Could anyone expect to hear so favorably from a customer after waiting eight weeks for delivery on machine? It was real production and satisfaction that prompted them to write this letter.

"On arrival of this machine we were so far behind on cutting that we thought sure one or two more machines would be required for our works, but owing to the high speed and the rapid cutting of this machine it has caught up with our work in a short time. We are now more than pleased that we had the patience and waited delivery on this tool, even if we were put to considerable inconvenience, as a lot of our work had to be sent out to be cut.

"We must say that this tool is certainly a great time-saver in actual time saved in operating the machine. We figure the operator's time saved alone will soon pay for this tool."

Several other interesting facts in this letter. Would you like a copy, together with other descriptive matter?



This machine cuts off 2¼" round Manganese bronze in 12 seconds. Compare this with your cutting time.

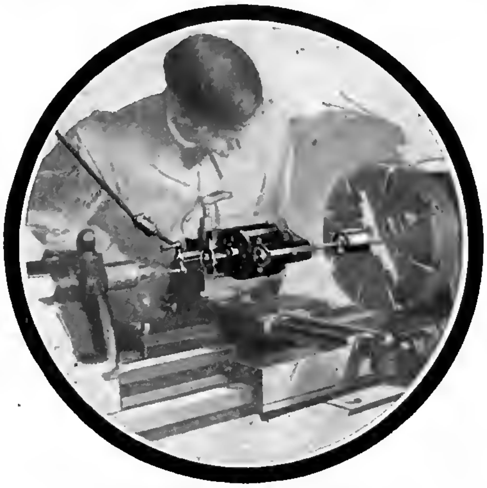
Note its rigid construction, it means increase in production.

PEERLESS MACHINE COMPANY

1607 Racine Street RACINE, WISCONSIN

A Portable Electric Grinder That Does Accurate Work

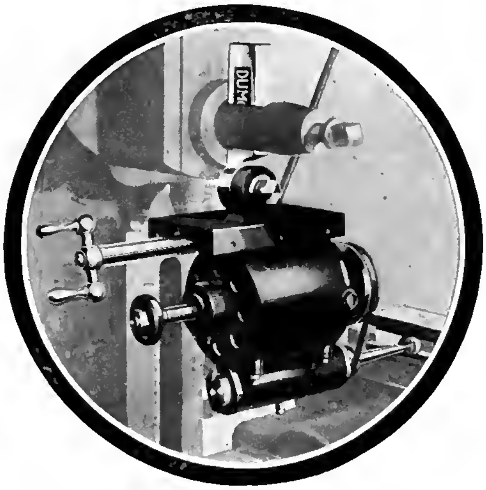
30,000 R.P.M.



The DUMORE doing a difficult job of internal grinding.

The ordinary grinding jobs—they're easy enough to do with the ordinary grinder. But how about some of your other grinding jobs—like those illustrated here, for instance? There's only one way to handle them efficiently—and that's with

DUMORE PORTABLE ELECTRIC GRINDERS

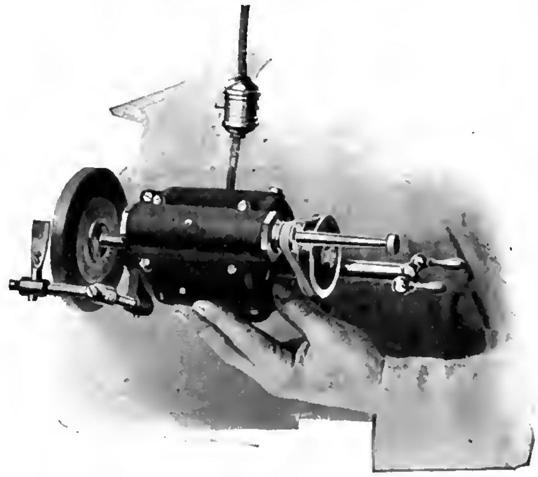


Doing a "hard to get at" job.

They are dynamically balanced and do the work with absolute accuracy—the only grinders with correct surface speed—30,000 R.P.M.

Weight only 17 pounds. Can be carried from one job to another and attached to lathe, shaper, miller or planer in a moment's time. Used on all kinds of different grinding jobs—longitudinal, cylindrical, external and internal.

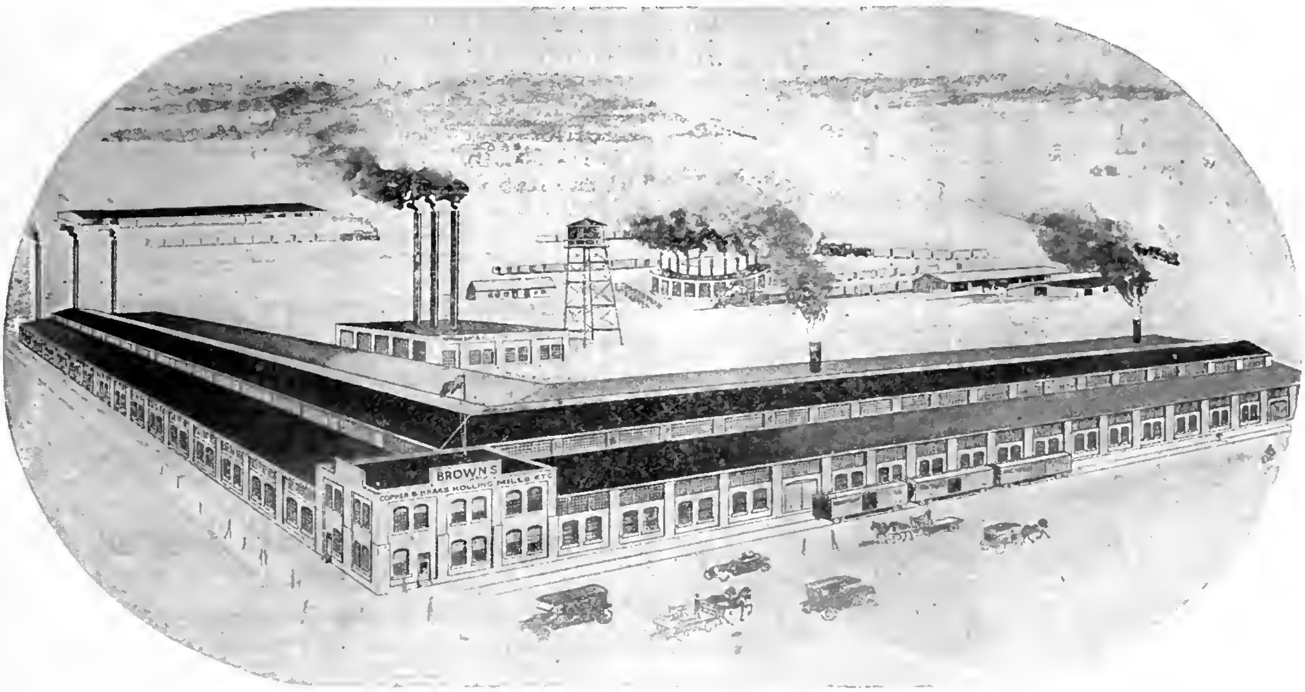
Tell us about your hard grinding problems and let us show you how you can profitably use a DUMORE. Write for full information and ask about our free trial offer.



Wisconsin Electric Company, 1702 Dumore Bldg. Racine, Wis.

Toronto Office: R. E. T. PRINGLE, LIMITED, 95 King St. East, Toronto.
Complete stock carried by Aikenhead Hardware Company, 17 Temperance Street, Toronto.

BEAVER BRAND — BROWN'S COPPER & BRASS ROLLING MILLS QUALITY — MADE IN CANADA



Brass, Bronze

AND GILDING METAL IN SHEETS, ROLLS, PLATES AND RODS

SPECIAL MARINE BRONZE ROD FOR SHAFTING AND BEARINGS

FOR DRILLING AND FREE TURNING ORDER BEAVER BRASS ROD

BEAVER BRAND "SPINNING BRASS"

If it's quality you want you will get it in extra measure by buying Beaver Brand products.

Our manufacturing facilities assure you the best of service and a moderate price.

Brown's Copper and Brass Rolling Mills, Limited

General Offices and Mills:

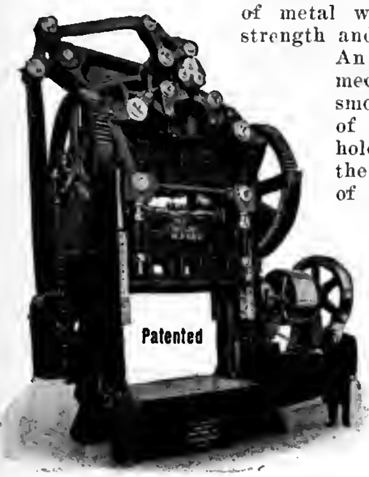
NEW TORONTO, CANADA

A few of the valuable features of the

"TOLEDO"

Toggle Drawing Presses

which should determine your choice:



The "TOLEDO" No. 268¼

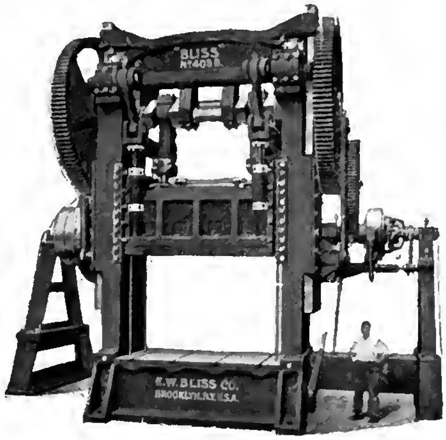
Massive frame with a distribution of metal which secures marvelous strength and low maintenance cost. An all steel simple toggle mechanism unequaled in smoothness and efficiency of action — in the blank holding pressure it exerts—the consequent elimination of wasters — the perfect timing which insures silent running and absolute safety to operator, as the slides are always under his full control.

60 sizes, weighing from 6,550 to 400,000 lbs., and adapted to work from the smallest and simplest to the most difficult special forms and shapes.

The Toledo Machine & Tool Co.
TOLEDO, OHIO

Saves Time — Saves Power
Makes Output Uniform

BLISS



Do you have to draw or form large sheet metal goods from heavy stock? If you do you will appreciate the patented toggle motion of the

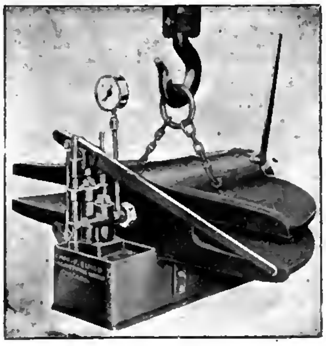
BLISS DOUBLE-CRANK TOGGLE PRESSES

Its action speeds up the work. It requires less power — and the results are uniform and better. *Send for Catalog* 11-*G*, stating requirements.

E. W. BLISS CO., 20 ADAMS STREET BROOKLYN, N.Y., U.S.A.
Chicago Office: 622 West Washington Boulevard.
Detroit Office: Dime Bank Building.

Elmes Portable Hydraulic Forcing Press

SHOWING PUMP



For pressing on or off cranks, wheels, couplings, etc.

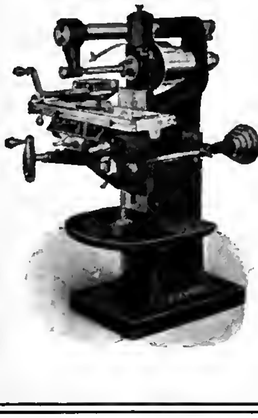
Designed to be lifted and carried about the shop by means of a crane.

The cylinder is made of cast steel, with a cast iron ram, oil or water tank, bronze pump with hydraulic gauge and hand lever, and a rack and pinion with lever for drawing back the ram, all self-contained and ready for use without making any pipe connections.

BUILT IN A VERY STRONG AND DURABLE MANNER WITH A GOOD FACTOR OF SAFETY.

Write for our catalogue showing complete line of Hydraulic Machinery.

Charles F. Elmes Engineering Works
217 N. Morgan Street, Chicago, U.S.A.
Over 50 years' experience building hydraulic machinery.



Cut Your Shop Costs

Nobody would think of putting 16-inch lathe work on a 30-inch lathe, then why leave small parts on a large Milling Machine?

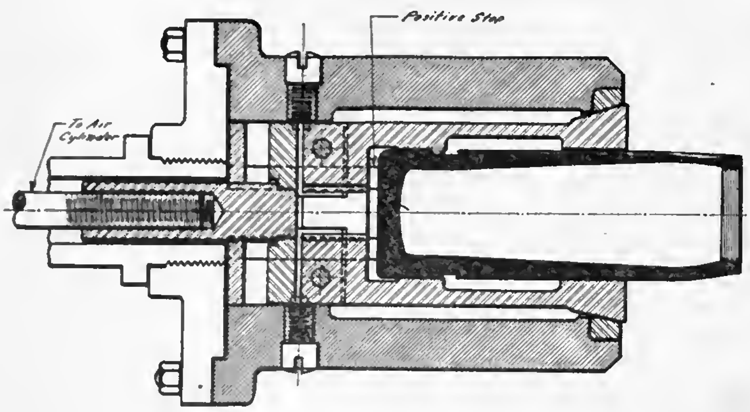
A Steptoe Hand Miller or small power feed can be handled quickly and will cut your production cost. You will have less money invested in your Milling Machines and have more machines to do the work.

That same principle applied to your small planer work will cut the cost of planer work.

A Steptoe Shaper will do the work faster because it can be handled quicker

The John Steptoe Company, CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

You Can Produce More Shells Per Day



M. E. C. Air Operated Hinge Collet Chuck adapted for rough and finish boring operations.

If you are interested in Machining Fuse Plugs, Shells, Etc., the best Chuck and Taps are M. E. C.

These devices will increase your production from 25 to 40 per cent. over any other method now employed.

ONCE KNOWN—ALWAYS USED

It will pay you to investigate at once.

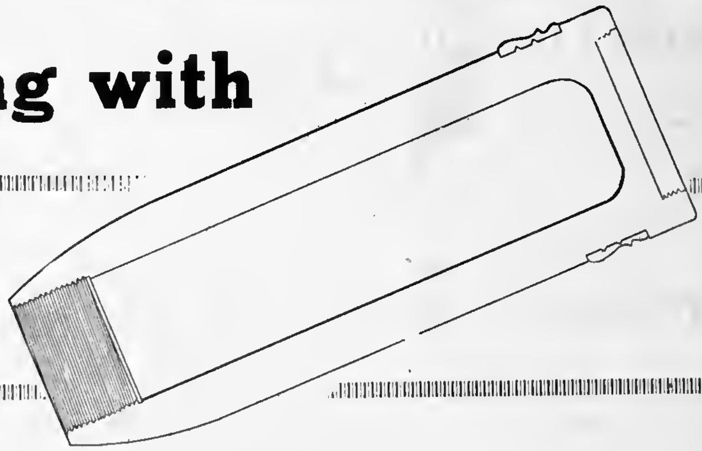
Manufacturers Equipment Company

175-179 North Jefferson St., CHICAGO, ILL.

FOREIGN AGENTS: C. W. Burton Griffiths & Co., Ludgate Circus, Ludgate Hill, London, England.
Louis Besse, Bureaux & Caisse, 39 Rue de Lappe, Paris, France; Geo. A. Todd, 152 Bay St., Toronto, Canada

Time Threading with

MURCHEY TAPS AND DIES



18-pdr. Shrapnel	- -	25 seconds
18-pdr. High Explosive	-	60 seconds
4.5-in. High Explosive	-	60 seconds
6-in High Explosive	-	60 seconds

Also you save time of rechucking which is fully equal to this.

Threading is done on same machine nose is finished. No extra machine is required.

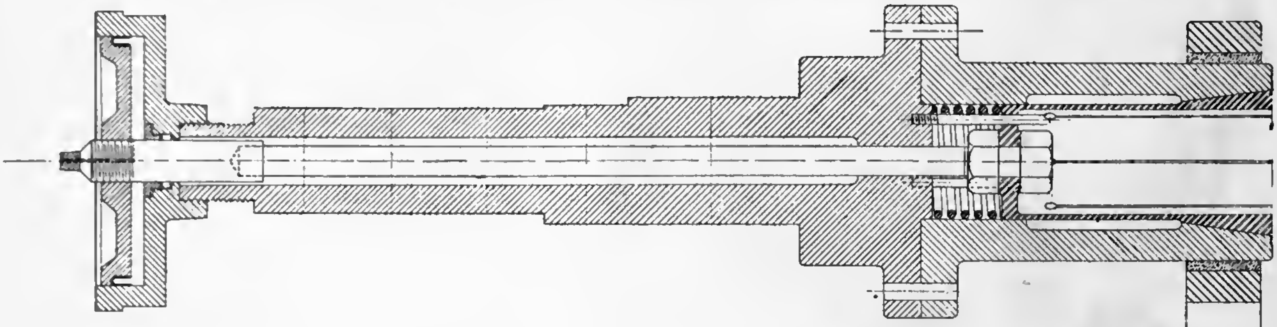
The largest American firms are doing all the threading on shells up to as large as 12" with **Murchey Collapsing Taps** and **Murchey Self-opening Dies,** and are getting most desirable results.

Send us Blue Prints of your requirements and we'll gladly quote you on the necessary tools.

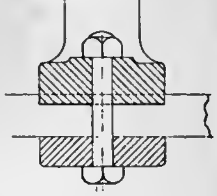
MURCHEY MACHINE & TOOL COMPANY

75 Porter Street, Detroit, Mich.

INCREASE YOUR PRODUCTION



AIR OPERATED COLLET CHUCK



This Chuck will enable you to machine 25 to 50% more Shells per day.

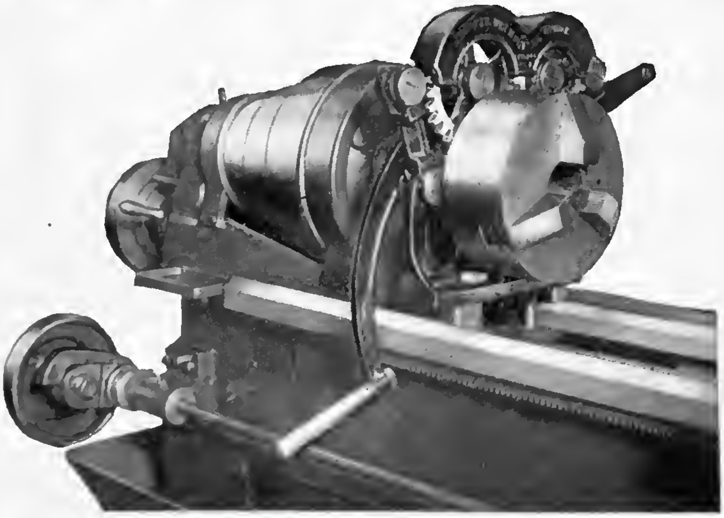
MADE IN ALL SIZES. ADAPTABLE TO ANY HOLLOW SPINDLE LATHE.

Particulars on Application. ***Prompt Delivery.***

HYDE ENGINEERING WORKS

P.O. Box 1164 **27 William St., MONTREAL**

Speed Up! Production
With a Barker Wrenchless Chuck



You don't consider money spent, on something which will bring returns—it is invested.

A chuck which will cut the time of setting-up in half and at the same time not be prohibitive in initial cost or maintenance is a most worth-while investment in your plant —is it not?

Barker Wrenchless Chucks are proving their worth as an investment in many plants where multiple chucking has been a profitless bugaboo—perhaps your neighbor is a Barker fan—let us send you a list of users in your territory.

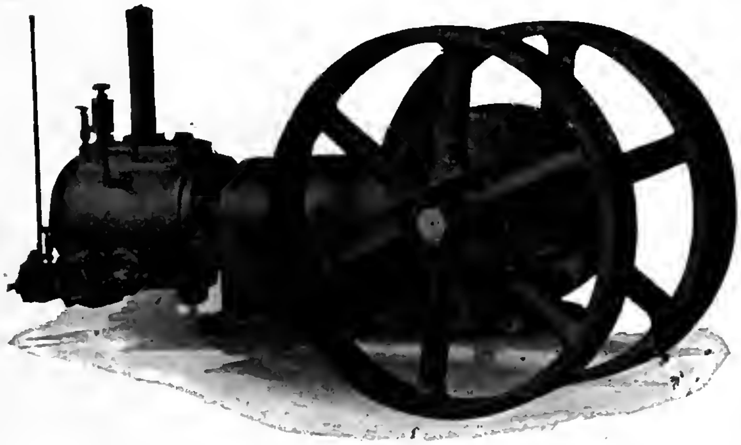
An inquiry to-day will bring the Barker proposition to you by return mail. You can't go wrong and you do not obligate yourself in any way whatsoever.

The entire opening and closing operation is accomplished with a short action of the hand lever—think what this means in saving of time.

THOMAS ELEVATOR COMPANY

22 South Hoyne Avenue - - CHICAGO, ILLINIOS, U.S.A.

FOR EVERY PURPOSE



there is an Ingersoll-Rand Air Compressor of suitable size.

They take up little space, but give **maximum power** at **minimum operating cost.**

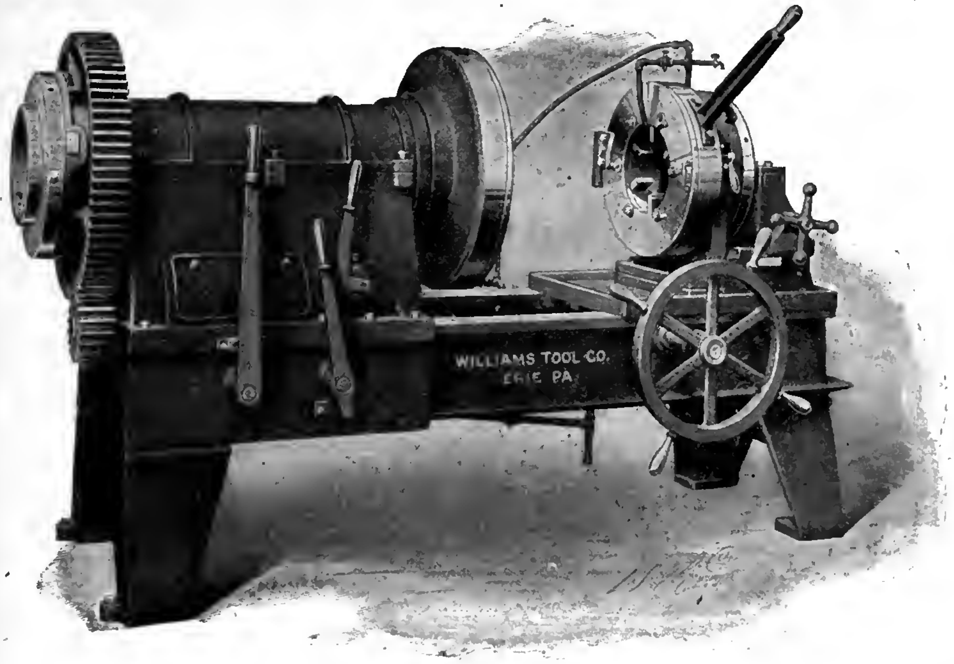
An enquiry will bring full information promptly.

CANADIAN INGERSOLL-RAND CO., LIMITED

Commercial Union Building - MONTREAL, CANADA

VANCOUVER NELSON WINNIPEG TIMMINS COBALT TORONTO SYDNEY

Works: Sherbrooke, Que.



The gas light was a big improvement over the tallow dip, but it had to give way to the electric light; and the Tungsten has superseded the little glimmer that once delighted us.

If you are still employing pipe-cutting methods as antiquated as the tallow dip, you need a Williams Pipe Machine, which occupies the same position in the pipe-cutting field as the Tungsten does in the lighting world, to bring you up-to-date.

Let us quote you prices and terms: any machine to cut 10 sizes of pipe between 1-4 inch and 18 inch, with any kind of power.

Anyone making, selling or buying a pipe machine, claimed to be a Canadian-made Williams Pipe Machine, does so without right or authority from us, and is liable to prosecution for damages.

Williams Tool Co., Erie, Pa., U.S.A.

AGENTS:

A. R. WILLIAMS MACHINERY COMPANY

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

If any advertisement interests you, tear it out now and place with letters to be answered.

Greater Production——Less Upkeep

The Landis 1½" Single Head Bolt Cutter, which may be equipped for threading bolts and pipe and tapping nuts, both right and left-hand.

The Landis Die, by virtue of its design, is bound to give a higher production, because the chaser is strictly **tangent** to the stock, thereby **reducing the friction** to a minimum.

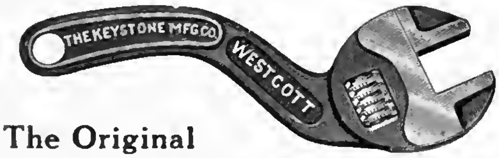
The Chaser never requires annealing, hobbing or retempering, but it is simply ground on the end and advanced in its holders. Our customers report that one set of chasers will stand from 90 to 120 grindings, thereby giving the **Landis Chaser** a life from **twenty** to **thirty** times that of any other die—that means small upkeep.

We will be glad to give further particulars—send us your requirements at once.

LANDIS MACHINE COMPANY

WAYNESBORO, PA., U.S.A.

EXCLUSIVE CANADIAN AGENTS: WILLIAMS & WILSON, MONTREAL, CANADA



The Original "WESTCOTT" Adjustable "S" Wrench

HANDLE MALLEABLE IRON, JAW FORGED STEEL.

The "Westcott" Wrench is acknowledged to be the most convenient and useful wrench for general use, and can be used in many places inaccessible to the Monkey Wrench. These wrenches are made of first-class material, are strong and durable.

The genuine "Westcott" Wrenches have the trade-mark "Westcott" on the handle.

KEYSTONE TOOLS

GIVE THE MAXIMUM SERVICE PER DOLLAR INVESTED

They are unique in their strength, utility and appearance. **Mechanics prize them,** especially the piece-worker, because they make for better and faster work.

Any better class wholesale house will supply them. Ask us for address of nearest dealer.

THE KEYSTONE MFG. CO.

BUFFALO, N.Y., U.S.A.

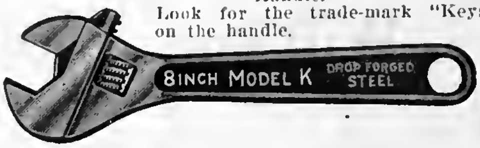
"Keystone Quality" Means the Utmost —— in Tools ——

"KEYSTONE" Weston Ratchet

For Square Shank Drills Only.
STRONGEST RATCHET MADE.
Fully guaranteed.

KEYSTONE "Model K" Wrench

All drop-forged steel.
No. 1—Polished all over.
No. 2—Polished Head—Enamelled Handle.
Look for the trade-mark "Keystone" on the handle.



SIR HENRY IRVING
As Hamlet in "Hamlet, Prince of Denmark"

"To be, or not to be, tha. is the question,
Whether it is nobler in the mind
To suffer the slings and arrows
Of outrageous fortune,
Or to take arms against a sea of troubles"

Often users of Babbitt Metals are confronted with the question

To Be, or Not To Be

It means much to the engineer to get Babbitt Metals of UNIFORM QUALITY.

Our melting pot has a capacity of 35 tons.

This means 35 tons of Babbitt Metal of one uniform quality.

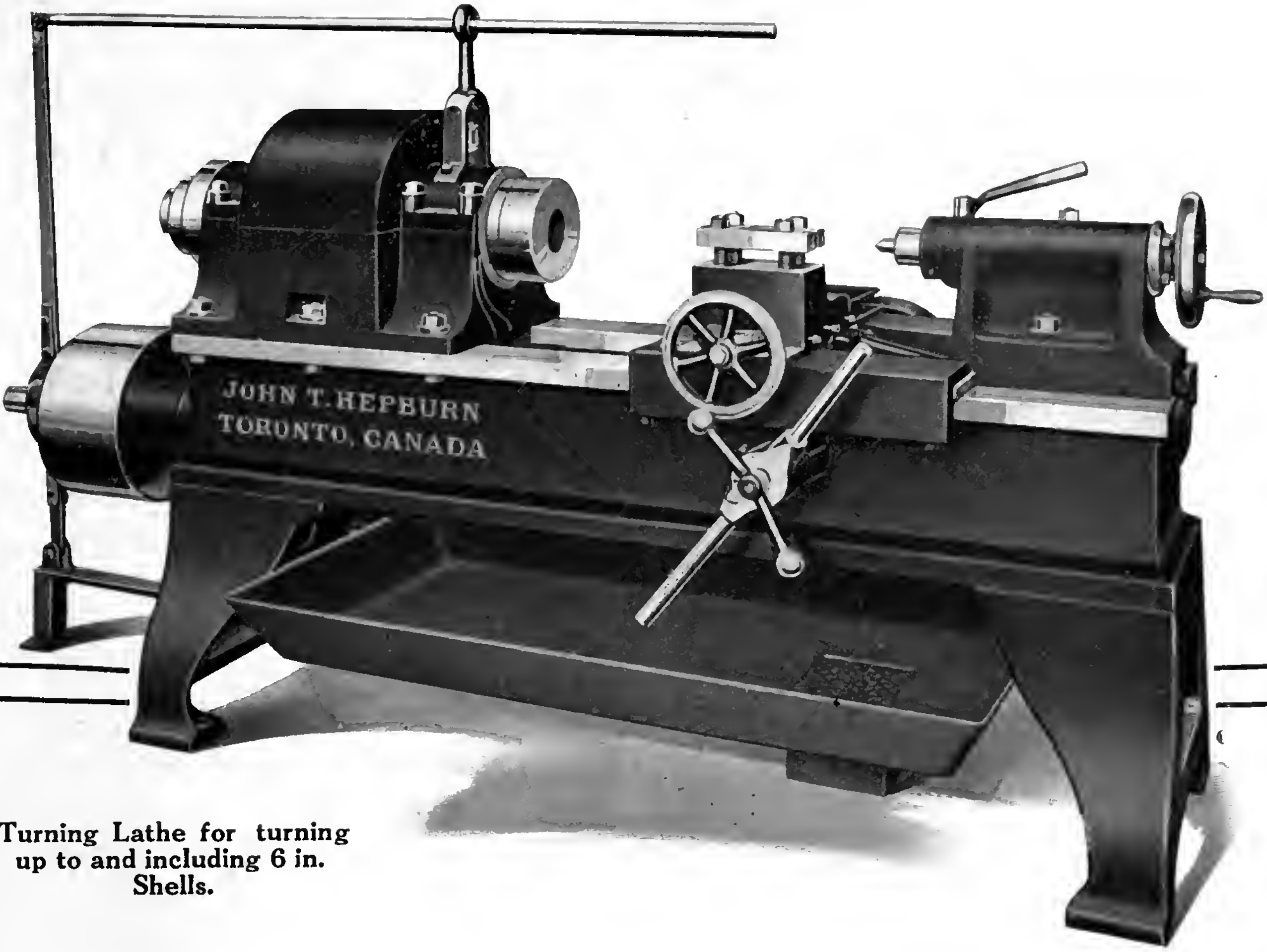
Engineers will avoid "a sea of troubles" if they specify IMPERIAL GENUINE Babbitt Metal for high speed and all bearings carrying extremely heavy loads, and HARRIS HEAVY PRESSURE, "The Babbitt Metal without a fault" for all general machinery bearings.

We guarantee our Babbitt Metals to give EXCELLENT SERVICE.

THE CANADA METAL COMPANY, Limited

HEAD OFFICE AND FACTORY **TORONTO** FRASER AVENUE

Branch Factories: MONTREAL, WINNIPEG



Turning Lathe for turning up to and including 6 in. Shells.

The Hepburn Heavy-Duty Shell Lathes

Hepburn Lathes are entirely made-in-Canada. Their quality keeps pace with the best machine tools on the market, and they are backed by a firm with an established reputation for square dealing.

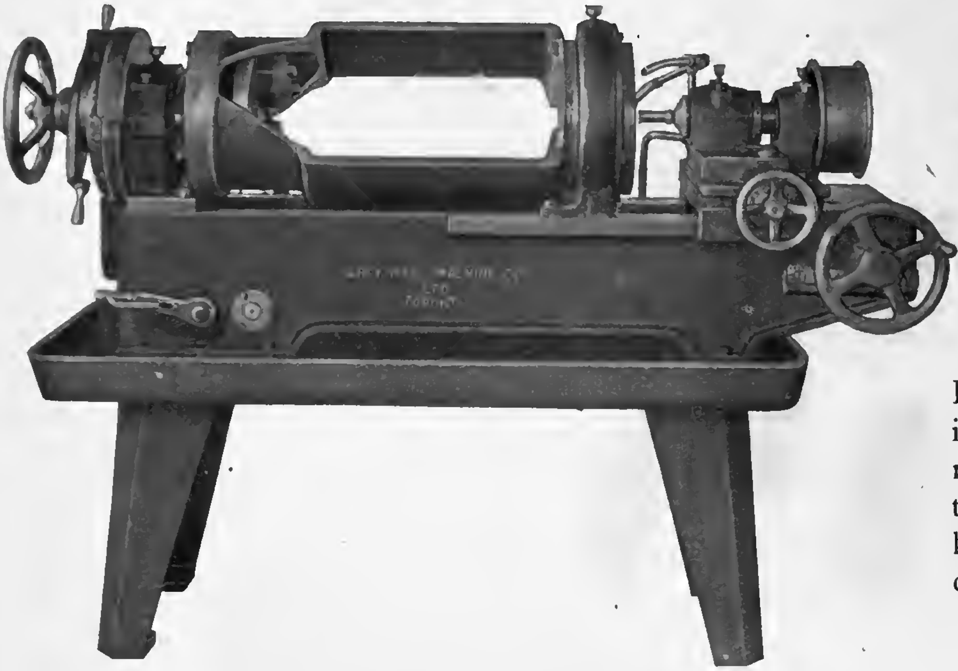
Hepburn capacity gives you the advantage of *immediate delivery,* and enables us to give the very best of service.

Write for prices and full particulars.

SPEED
ACCURACY
POWER
STRENGTH
SIMPLICITY

John T. Hepburn, Limited, 18 to 60 Van Horne Street, TORONTO, CANADA

THREAD MILLERS



MACHINE FOR 9.2 SHELLS

Two speeds for Threading and Facing all sizes from 4.5 to 9.2 Shells, Sockets and Plugs.

Designed and built to insure continued accuracy and high production, with ease of handling and low maintenance cost.

PROMPT DELIVERY

SPECIAL LATHES

Equipped for the various operations and

READY TO USE.

Designed and built for heavy duty and continuous service. Drive is capable of exerting 30 h.p. All other parts in proportion.

20-INCH SWING **8-FOOT BED**

PROMPT DELIVERY

The Gray Mfg. & Machine Co., Limited

Toronto, Canada

PULLEYS

No Keys

No Set Screws

In Perfect Balance

Lighter

Stronger

Better Belt Surface

The Dodge Standard Wood Split Pulley

The Wood Split Pulley is better than either cast iron split pulleys or steel split pulleys for the following reasons—

The wood pulley is lighter, stronger, better balanced, and provides a very much better belt surface. It costs 33 1-3% less money and provides 50% more returns in horse-power value. It may be run at very much higher speeds with no danger of bursting—also it may be had quicker and in a greater range of sizes.

It costs less to get—less to put on—and less to keep.

We make approximately 300 Dodge pulleys every day—everybody uses them.

There are more Dodge pulleys making ammunition than any other kind—you can get them quick.

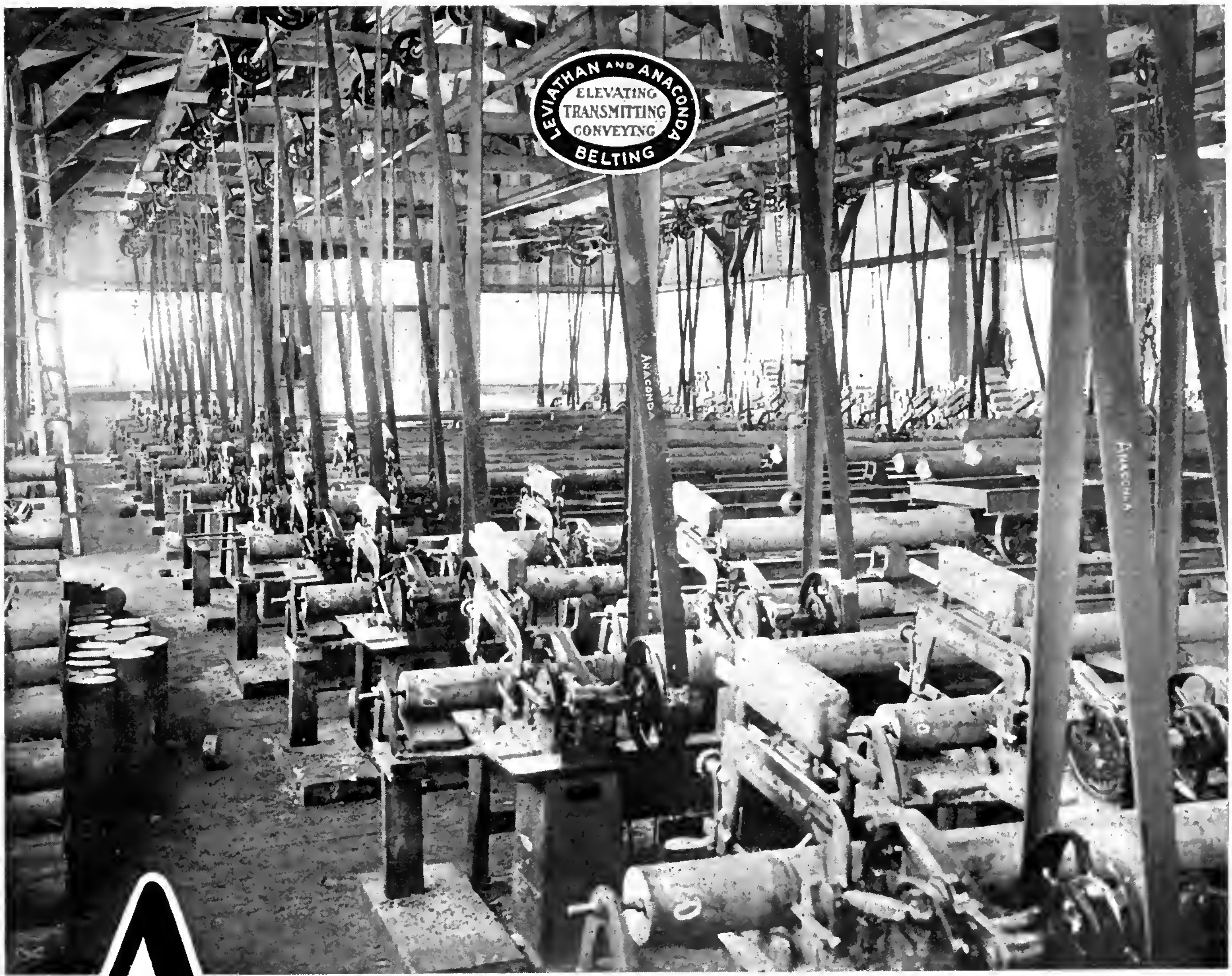
Every pulley is thoroughly nailed. Every pulley is guaranteed for Double Belts.

We are Canada's greatest pulley makers.

If you have not our Books, write us.

DODGE MANUFACTURING COMPANY

Toronto - - Montreal



Anaconda Belting

1800 Feet **2½" 4 Ply**

This is the belt you should be using if you want the largest delivery of power and maximum belt service in driving machines such as Saws, Turret Lathes, Heavy Duty Drills, Grinders, Etc., that use liquid cutting compositions, because it is filled with a composition that makes it heat, oil, water and acid proof.

The saws, as illustrated above, are all "Draw-cut" which means that the strain on the belt is intermittent and if the belts slipped, satisfactory work could not be done.

Anconda Belting possesses unusual wearing qualities, and reduces power loss, repairs, "take-ups" and attention to the minimum. It is of greater general serviceability than any other belt. A trial will convince you.

The initial cost is 50 per cent. less than leather.

MAIN BELTING COMPANY OF CANADA

32 Front St. W., Toronto *LIMITED* 10½ St. Peter St., Montreal

TRADE MARK

TRADE MARK

TWO SATISFIED USERS

154 Fourth St.,
Union Course, L. I.,
March 15, 1915.

Gentlemen:—

The writer can say that Magnolia Metal has given him the greatest satisfaction for bushings, bearings, crosshead shoes, and guides.

For long wear, high speed and freedom from trouble from grit it cannot be beat.

Yours truly,
A. L. BENNETT.

Portland, Ore.,
August 18, 1915.

Gentlemen:—

Three years while Chief Engineer for the Luna Lead Smelting Co., we used Magnolia Metal for everything and found it to be without equal for bearings—main and crank—lay shafts, etc., etc., on internal combustion oil engines.

Have also found Magnolia Metal to be satisfactory in every respect on other types of prime movers and use nothing else.

Yours respectfully,
W. W. COONS.

PRACTICAL ENGINEER POCKET BOOK:

Over 600 pages. A valuable reference work imported from England and sold as an advertising medium at the low price of 40c. post paid.

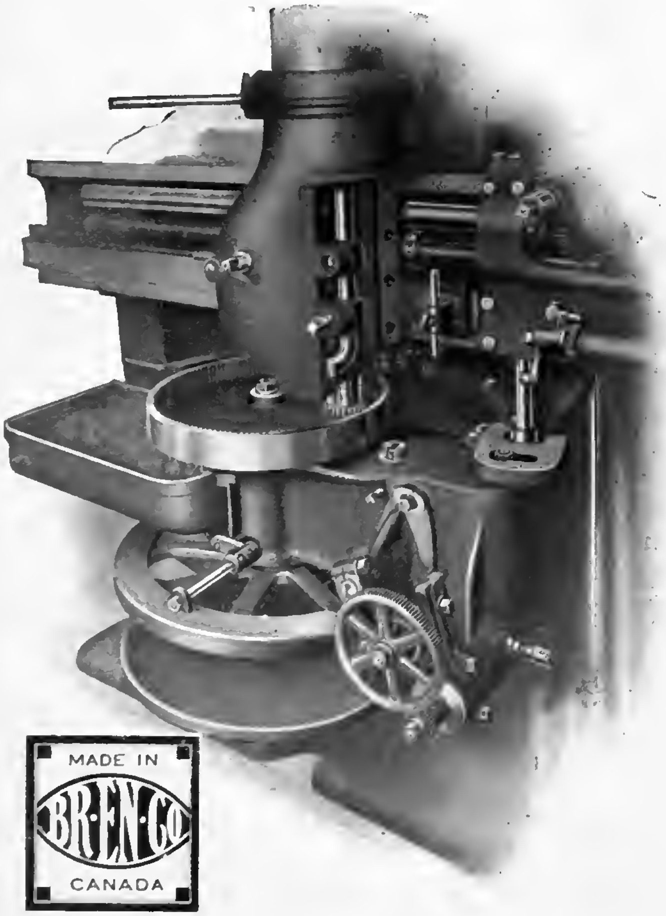
Address Montreal Office.

SOLD BY LEADING DEALERS EVERYWHERE OR BY

MAGNOLIA METAL CO.

OFFICE AND FACTORY:

225 St. Ambroise St. MONTREAL



Fellows 36" Gear Shaper recently installed in gear department.

GEARS

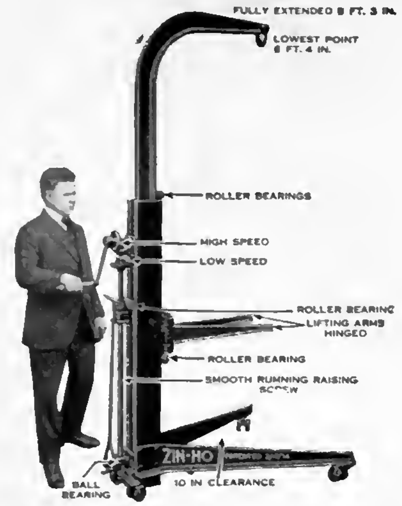
Generated on the Fellows Gear Shaper are more accurate than gears cut on any other machine.

This machine is specially adapted for cutting all kinds of spur gears, Internal, External, Cluster and Shoulder. Capacity up to 36" diameter. 5" face, 4" diametral pitch.

We can guarantee you accurate work, prompt service and reasonable prices.

Brown Engineering Corporation, Limited

415-419 KING ST. WEST, TORONTO



Especially Adapted for Handling 8" and 9.2 Shells

¶ A light but sturdy crane for machine shops—an efficiency unit for munitions plant.

¶ No chains to slip. Two speeds; easily operated by one man. A smooth-running screw enables you to stop the load quickly and with exactness.

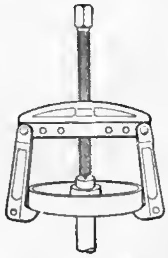
¶ The arms may be swung back when boom only is in use.

¶ Use it to transfer loads to cars, trucks, platforms, etc.

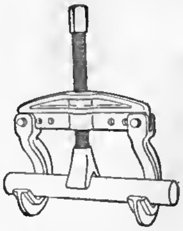
Guaranteed Lifting Capacity, 4,000 lbs.
Weight only 300 lbs. Send for Catalogs.

Zin-Ho Manufacturing Co.
Dept. H.
1324 Michigan Ave., Chicago, Ill.

Crane's New Model Patent Wheel Puller



Removing Work Near End of Shaft



Pipe Bending and Shaft Straightening Attachment

The screw has a flat end with inserted tempered tool steel point that will not spread cutters. Makes its own centre on work that has none. The strain is taken on the flat end of the screw. Grease to keep from cutting. The screws are made of high carbon steel and case-hardened all over.

The pipe-bending attachment consists of a pair of arms and forked end for the screw. Two sizes to fit the No. 2 and No. 3 Two-Arm Puller. **It is indispensable in a repair shop** for straightening propeller and jack shafts, handling exhaust pipes, and removing universal joint yokes, etc.

We absolutely guarantee the workmanship and material in our tools.

Write for full particulars.

The Crane Puller Co.
54 Lake Street
ARLINGTON, MASS., U.S.A.

Canadian Distributors: Canadian Fairbanks-Morse Co., Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary; John Millen & Son, Montreal, Toronto, Winnipeg, Vancouver.

C.T.S.

Cab Tyre Sheathing Cable

For Electric Tools and Portable Lamps

This cable cannot be excelled for trailing purposes—it is just in its element where there is abuse and severe usage.
Get acquainted and you'll always use it.
Send in a trial order.

Agents for Canada:

J. D. Lachapelle & Co., 317 St. James St., Montreal

Manufactured by St. Helens Cable & Rubber Co., Ltd., Warrington

Electric Travelling Cranes
(Direct or Alternating Current)

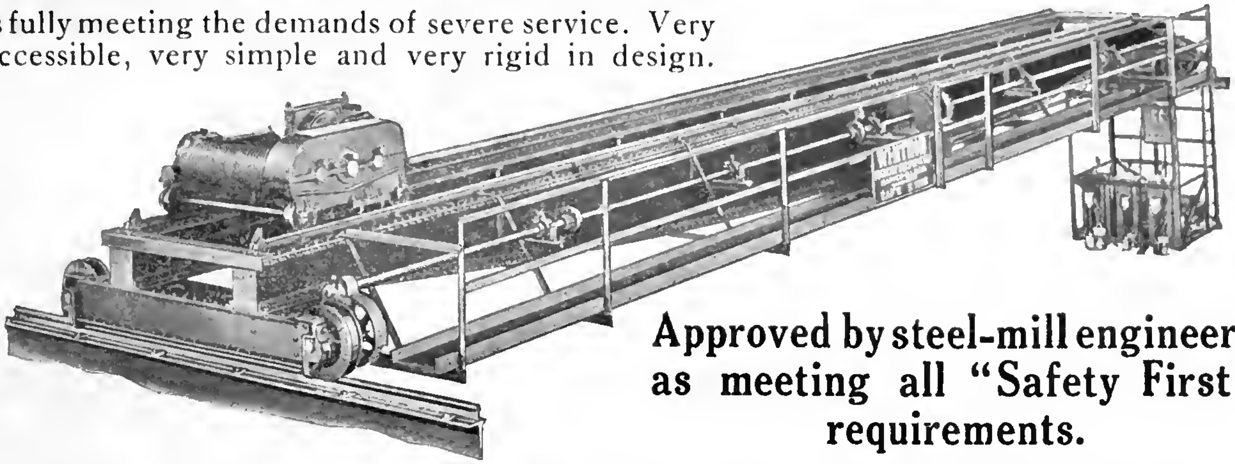
Steam and Electric Derricks
(Stationary or Travelling)

Up-to-date design. Built for fast, continuous service.
ACCESSIBILITY—DURABILITY.

Dominion Bridge Company, Limited
MONTREAL

The Whiting Type "R" Crane

is fully meeting the demands of severe service. Very accessible, very simple and very rigid in design.



Approved by steel-mill engineers as meeting all "Safety First" requirements.

Trolleys made in standard sizes from 1 to 100 tons capacity—SMALLER SIZES KEPT IN STOCK FOR PROMPT SHIPMENT. Specify a Whiting type "R" on your next inquiry.

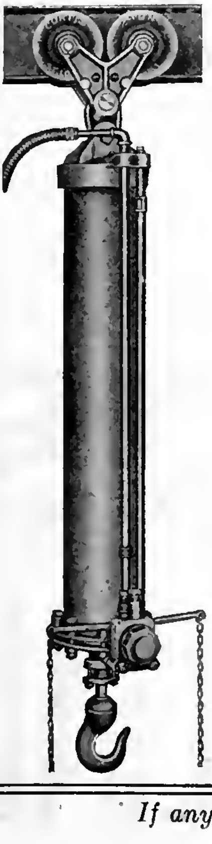
Full particulars on request.

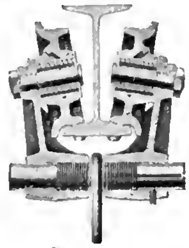
Complete Foundry Plants

Designed, Equipped and Put Into Operation

CRANES OF ALL TYPES

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U. S. A.
CHICAGO SUBURB.





CURTIS, St. Louis, U.S.A.

AIR COMPRESSORS — AIR HOISTS — TROLLEYS AND TROLLEY SYSTEMS—SAND BLASTS—PNEUMATIC AND HYDRO-PNEUMATIC ELEVATORS—JIB AND TRAVELING CRANES.

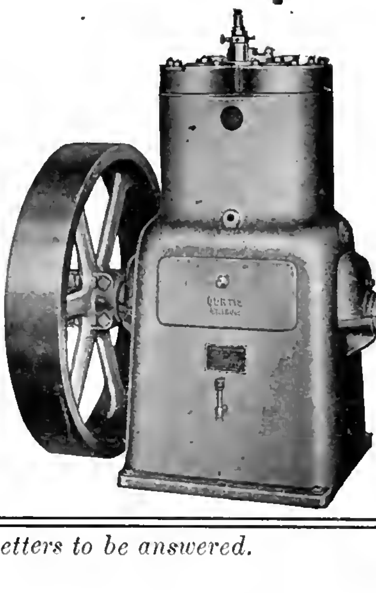
We have specialized for over 22 years on pneumatic machinery. We have developed the simple air cylinder into a straight line motor with wonderful speed control and dependability capable of the widest application to hoisting problems.

Our new controlled-splash oiling system with regulatable sight feed cylinder oiling is something entirely new in air compressor design.

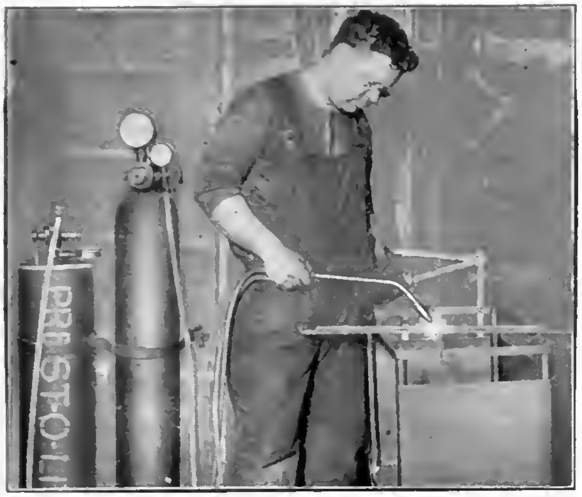
Complete catalogs and descriptive circulars on our entire line furnished on request.

Curtis Pneumatic Machinery Co.

1585 Keinlen Avenue - St. Louis, U.S.A.
New York Office - 532F Hudson Terminal



Oxy-Acetylene Welding and Cutting



All-Metal Hospital Furniture Is Made Better by This Process

Many large manufacturers of all-metal hospital furniture are employing oxy-acetylene welding to improve and simplify the finished article, and, at the same time, cut production cost.

Oxy-acetylene welding is less expensive and superior to riveting—provides a better, neater appearing and more lasting joint.

There is practically no line of metal manufacturing or repairing in which oxy-acetylene welding has not already established itself firmly as standard, routine method.

Every desirable feature of oxy-acetylene welding and cutting is provided by the

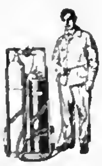
Prest-O-Lite PROCESS

Employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready-made carbide gas) is backed by Prest-O-Lite Service, which provides dry, purified gas, insuring better welds, quicker work, and lower cost, and also avoids the large initial outlay and heavy depreciation incurred in making crude acetylene in a carbide generator.

The necessary equipment is not expensive. We furnish high-grade welding apparatus for $75; acetylene service at additional cost. Adaptable for oxy-acetylene cutting by the addition of a special cutting blow pipe. Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene—any average workman who understands metals can learn the process quickly and easily.

If you are interested, we will gladly send illustrated literature and interesting data showing actual instances of savings and manufacturing improvements made by others. It may suggest valuable ideas to you in handling similar work. ASK FOR IT.

The Prest-O-Lite Company, Inc.
Dept. F.
The World's Largest Makers of Dissolved Acetylene.
Canadian Main Office and Factory
MERRITTON, ONTARIO
Factory Branch : Winnipeg, Man.
53 Branches and Charging Plants



Keep Canadian Factories Going. Insist on Buying Goods MADE IN CANADA.

Thor SINGLE VALVE CHIPPING-HAMMERS

Equipped with a valve mechanism so perfectly balanced as to eliminate practically all vibration.

Made in five sizes, with piston diameter of 1 1/16" by strokes of from 1 to 5", designated as sizes A, B, C, D and E.

Shipped on Trial at Our Expense

Independent Pneumatic Tool Co.

CANADIAN OFFICE:
334 St. James St., MONTREAL, QUE.
General Offices : Thor Building, Chicago, U.S.A.
Branches: New York, Pittsburgh, Detroit, San Francisco, Birmingham

---

The Diamo-Carbo Grinding Wheel Dresser

Cheaper Than a Diamond

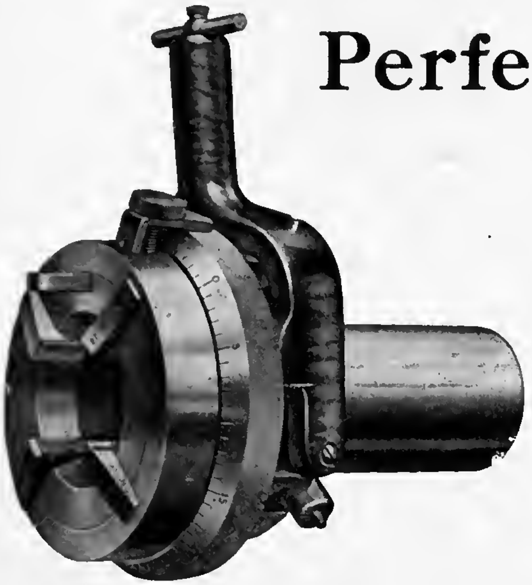
The Diamo-Carbo Dressers do their work just as well as Diamonds; are more economical, and are so low-priced that each grinder may be provided with its own Dresser. Adopted by the foremost shops of the world. Sent on trial.

We also manufacture Diamond Dressers and Huntington Dressers.

The Desmond-Stephan Mfg. Co.
URBANA, OHIO
Alfred Herbert, Ltd., Coventry, Agent for Great Britain.

If any advertisement interests you, tear it out now and place with letters to be answered.

Wells Self-Opening Dies
CUT
Perfect Screw Threads



WELLS SELF-OPENING DIE
has both face and hand trip.

The Wells Self-Opening Die cuts the thread with a fine shearing cut, then opens with a quick, positive snap.

Adaptability

The Wells Self-Opening Die can be used on screw machines, lathes, automatics, drill presses and bolt cutters.

Chaser Principle

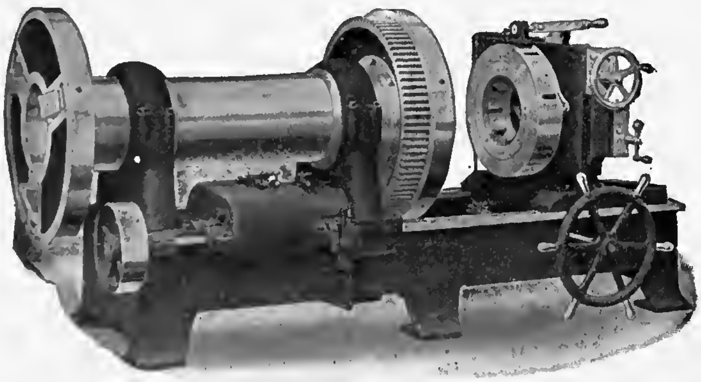
The Wells Self-Opening Die embodies an entirely new principle of design. The chasers are about four times as long as the threaded portions and are supported throughout their entire length and width by the solid sides of the slots in the body. They cannot squirm away from the work. Wear is reduced to a minimum throughout. Adjustment is simple, positive and accurate.

A large number of these Dies in Stock for immediate shipment.

Wells Brothers Company of Canada, Limited
GALT, ONTARIO

Sales Agents: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary.

9 12" Pipe Machines in 10 Months



A prominent oil producing concern has purchased nine No. 12 Duplex Improved Pipe Machines in less than a year. They have also purchased several smaller machines during the same time. Their experience with B & K machines covers a period of fourteen years. No sentimental reason governed their purchase—nothing except the perfect and satisfying service rendered by each machine installed.

BIGNALL & KEELER machines were selected by a host of prominent concerns, whose judgment you will do well to follow.

What is your size?

Bignall & Keeler Machine Works, Edwardsville, Ill.

CFM

The Canadian Fairbanks-Morse Co., Limited, Sales Agents for Canada

Montreal St. John Toronto Winnipeg Calgary Saskatoon Vancouver

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

To precede p. 607

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XV. TORONTO, JUNE 26, 1916 No. 29

EDITORIAL CONTENTS

THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-president.
H. V. TYRRELL, General Manager

Publishers of Hardware and Metal, The Financial Post, MacLean's Magazine, Farmer's Magazine, Canadian Grocer, Dry Goods Review, Men's Wear Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery and Manufacturing News, The Power House, The Sanitary Engineer, Canadian Foundryman, Marine Engineering of Canada.

Cable Address: Macpubco, Toronto; Atabek, London, Eng.

ESTABLISHED 1887.

CANADIAN MACHINERY AND MANUFACTURING NEWS

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors,
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS.

CHIEF OFFICES:

CANADA—Montreal, 701-702 Eastern Townships Building; Toronto, 143-153 University Ave., Telephone Main 7324; Winnipeg, 22 Royal Bank Building, Telephone Garry 2313.

GREAT BRITAIN—LONDON, The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C., E. J. Dodd, Director. Telephone Central 129600. Cable Address: Atabek, London, England.

UNITED STATES—New York, R. B. Huestis, 115 Broadway, N.Y., Telephone Rector 8971; Boston, C. L. Morton, Room 733, Old South Building, Telephone Main 1024. A. H. Byrne, 1104-5-6-7 Fort Dearborn Bldg., 105 W. Monroe St., Chicago. Telephone Randolph 3234. Mr. R. G. Langrill, 3112 Euclid Ave., Cleveland, Ohio, Tel. Prospect 1026R.

SUBSCRIPTION PRICE—Canada, Great Britain, South Africa and the West Indies, $3.00 a year; United States, $3.50 a year; other countries, $4.00 a year; Single Copies, 15 cents. Invariably in advance.

INDEX TO ADVERTISERS

Machining and Finishing the 8-inch High Explosive Shell--I

Staff Article

Although the manufacture of the large size high explosive shell by Canadian metal-working plants is now well established, it may be said that its initiation and development progress have occasioned little more than passing interest, the more noticeable of course because of the excitement and enthusiasm aroused when the manufacture of shrapnel shell was instituted. Experience in that direction has made possible the new achievement. The machine tool equipment, methods and devices, described, cover a plant which is easily a front-rank producer.

WHEN many months ago, shell makers in this country realized the fact that large shells would form a considerable, if not the greater portion of munitions output, the problems involved in their manufacture were the subject of considerable discussion. Numerous suggestions were advanced and various systems planned, all of which were influenced by each makers' experience on small and medium shells, and the desire to use existing plant to advantage when possible. Where a shrapnel plant was continuing on that product and starting upon 8 in. as well, the new plant required for the latter size would be equipped with machines selected definitely for it, enabling a greater degree of specialization to be exercised.

The plant with which this article deals changed over from 18 lb. H. E. to 8 in. shells, and in doing so were able to employ a number of their original machines in machining the base plug of the larger shell, while various other items of equipment were utilized as opportunity suggested itself. So well were the plans prepared and so thorough the organization that within —— days of the completion of the last shrapnel shell, 8 in. H. E. shells were being shipped, the rate of output rapidly increasing to the desired maximum.

As received from the makers the forging weighs approximately 290 lbs., the rough dimensions being 26 in. long, 8¾ in. diameter and 4½ in. bore. Finished sizes of the shell with driving band and base plug in position are shown in Fig. 1, the weight of the shell complete as shown being 177 lbs. 2½ oz. with a limit either way of 14 oz. The bursting charge and fuse bring this up to 200 lbs. with a limit either way of 3¼ oz.

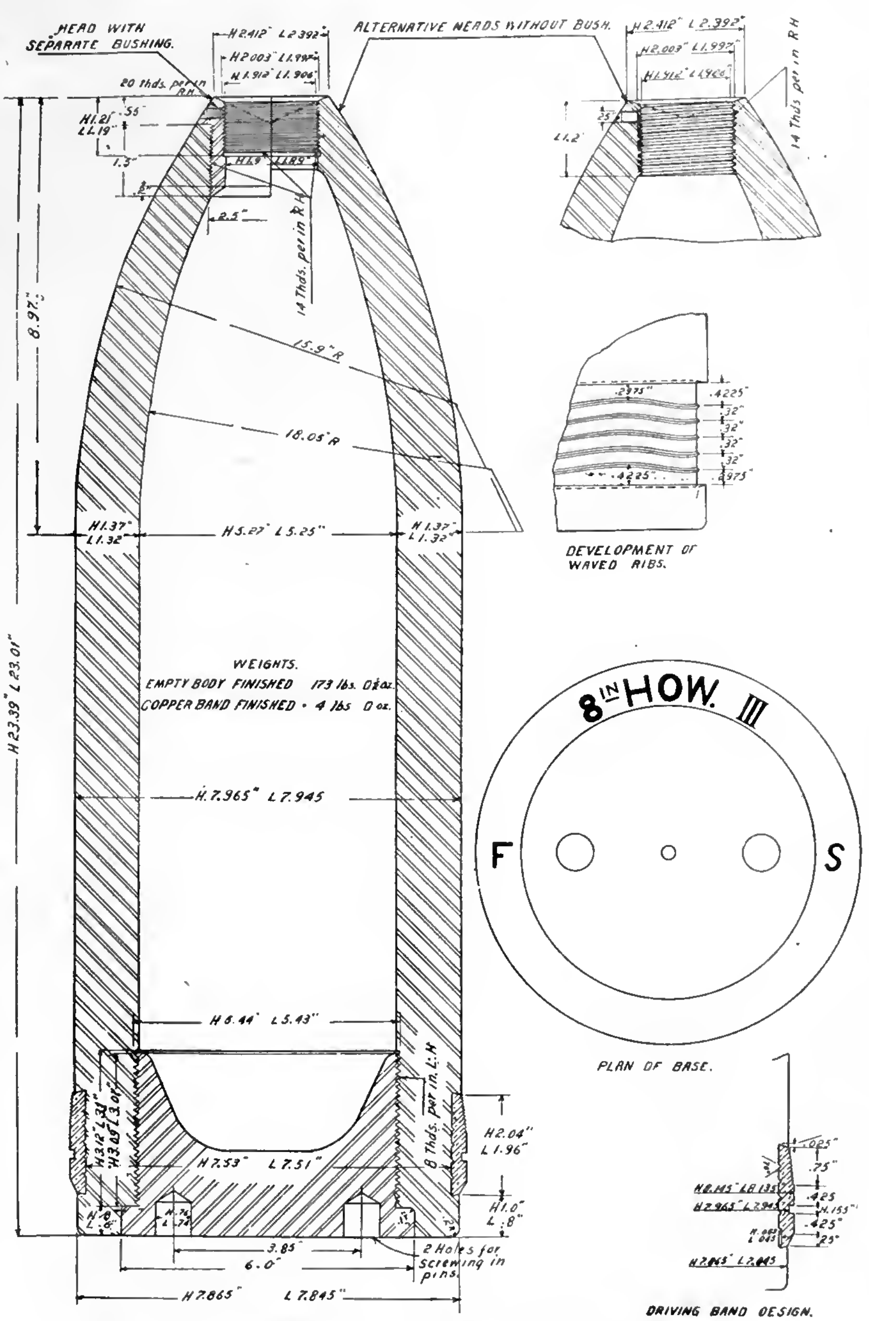


FIG. 1. AN 8-INCH HIGH-EXPLOSIVE SHELL.

Twelve separate and distinct machining operations are performed on the shell either by itself or when assembled with base plug and driving band. A diagrammtic representation of each operation is given in Fig. 4.

A battery of Colburn D2 heavy duty drills is employed on operation 1, two of these machines being illustrated in Fig. 5. A convenient type of lifting clamp and high speed chain blocks enable each operator to handle his own forgings very rapidly without extra help or undue fatigue. The forgings are dropped over a centering arbor mounted on a table, which slides forward so as to enable the forging to hang clear of the machine. The arbor consists of a tubular column containing a plunger supported by a coil spring of suitable size so that when the forging, weighing approximately 290 lbs. rests on the top of the plunger, the spring is compressed to a point which allows the bottom end of the forging to rest on the plate. The three set screws are now tightened to prevent the forging from turning around when the drill is started on top of the nose.

The upward pressure of the spring keeps the plunger wedged tightly in the inside of the nose, and as the plunger is made a close sliding fit in the support-

FIG. 2. RECEIVING DOCK FOR ROUGH FORGINGS.

ing column any wobbling of the nose when the drill is entering is kept within safe limits. The table is secured in its working position by a pin as shown and is moved out by a hand lever seen in Fig. 5.

The hole drilled is 1¾ in. dia., which leaves ample metal for boring out later so as to make this hole true with the main bore. The drill is now removed and a facing cutter with pilot is employed to remove stock till the surface is a definite length from the lower edge of the hole. The travel is regulated to an approximate depth indicated by a mark on the spindle, after which a little hand feeding brings the surface down to a point indicated by a hook gauge which is inserted in the hole and catches on the bottom edge, a mark on gauge indicating if the surface of the nose is machined to the desired amount.

Two cutting off machines made by the Williams Tool Co trim the open end of the shell to the high limit of the over all length, see operation 2, the object of this being to have a reserve of material for adjusting the final weights at a later stage of the operations.

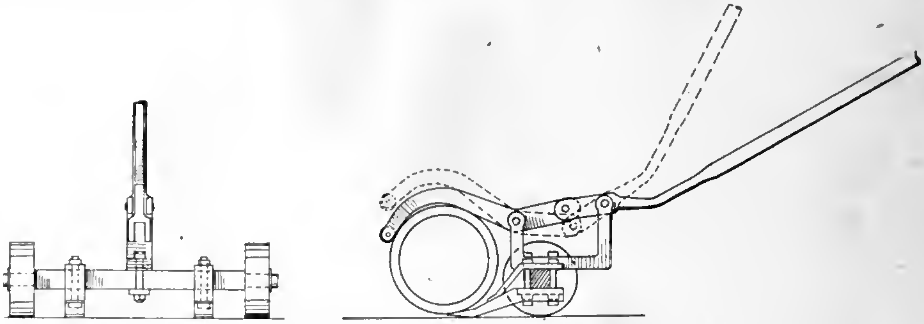


FIG. 3. TROLLEY FOR HANDLING ROUGH FORGINGS.

A careful consideration of boring requirements indicated the advisability of roughing out the inside of the nose so as approximately form the final outline of the interior, as the amount of metal left at this point during forging is in excess of that at other portions of the bore. As it also varies somewhat in forgings from different sources, the certainty of trouble due to the boring tool running into deep metal at the end of the cut was so great, that a separate operation is performed which enables the boring tool to complete its work without readjustment toward the end of its travel. Operation 3 which accomplishes this work is done in 20 in. vertical drill presses. A battery of three Bertram machines handling the work satisfactorily. The forging is inverted, the nose resting on a pilot block and the upper part supported by a rest mounted on the column of the machine. A double bladed profile cutter with flat blades is mounted on the lower end of a bar, and removes the excess metal to

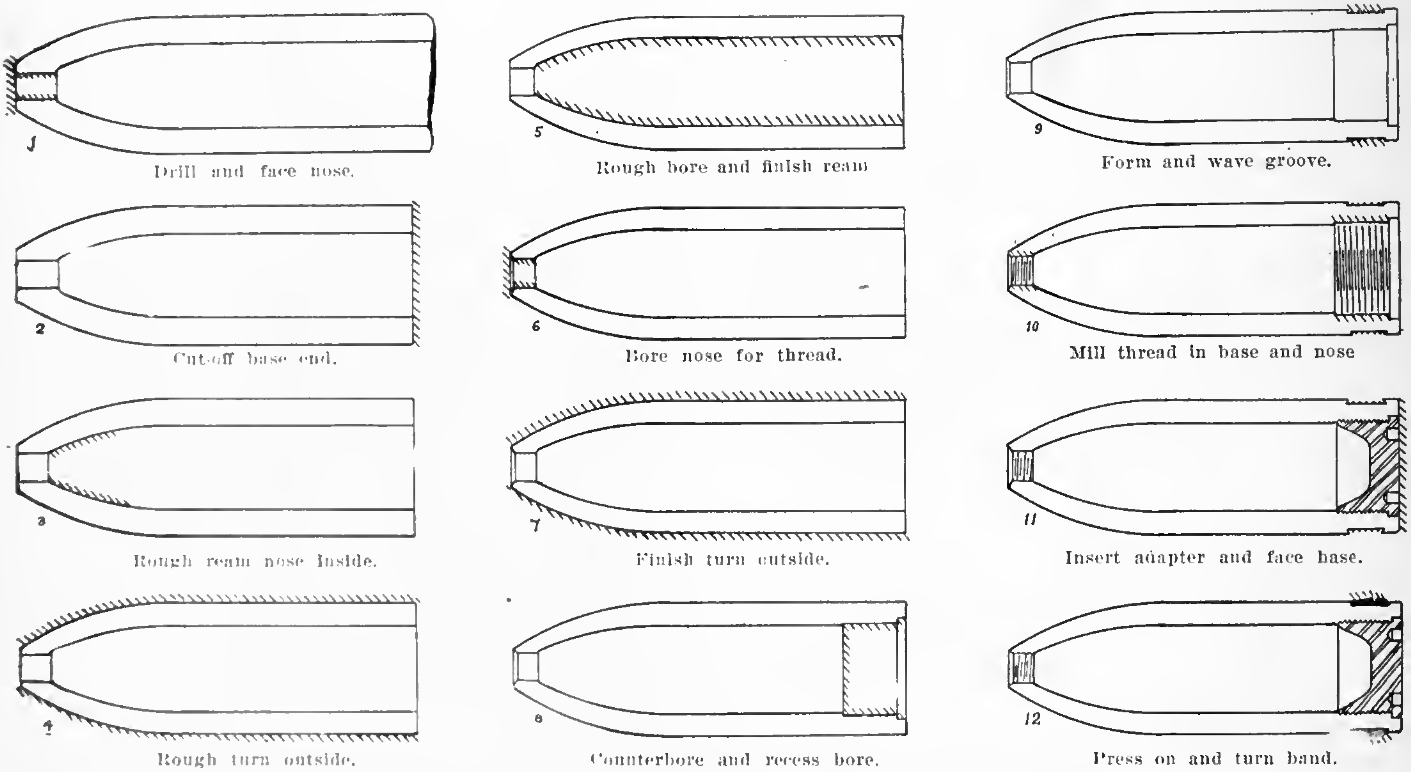


FIG. 4. DIAGRAM ILLUSTRATING SEQUENCE OF MACHINING OPERATIONS.

a predetermined amount. As the shell is resting on a machined surface it allows the use of positive stops on the machine for stopping the feed at a uniform point. As this is a roughing operation only, the cutters are fed by hand

FIG. 5. HEAVY DUTY DRILLING MACHINES PERFORMING INITIAL OPERATIONS ON FORGINGS.

to the limit of capacity, a copious supply of cutting compound being used.

The handling tackle for this machine is suspended from chain blocks running on a overhead rail which allows the work to be picked up and deposited within a considerable radius of the machine.

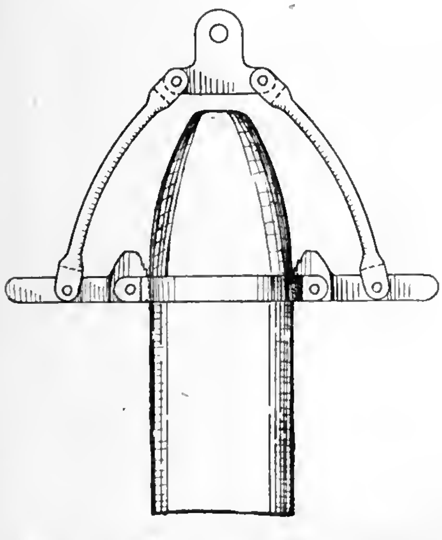


FIG. 6. AUTOMATIC LIFTING CLAMP FOR PLACING FORGINGS ON ARBOR, SHOWN IN FIGS. 5 AND 7.

Preliminary Turning

Rough turning which constitutes operation 4 is the heaviest part of the machine work, and the rate of production possible with high speed cutting tools demands lathes of exceptionally rigid and powerful design. Among the machines engaged on this work are five Canadian Fairbanks, one American Tool Works and one Le Blond, the first being 26 in. and the two latter 30 in. lathes.

When operations were commenced each machine turned the complete length of the forging, profile attachments of conventional design being employed to form the nose. This necessitated mounting the cutting tool at the left side of the tool rest, with the result that the overhang of the tailstock spindle, which was necessary to clear the width of carriage, was excessive allowing the work to yield so that feeds had to be cut down to a point that interfered with production. Part of the lathes therefore were devoted to turning the straight portion of the body and others were retained for forming the nose only, these latter having the cutting tool mounted at the right side of the tool rest, reducing the tailstock overhang to a minimum and permitting the heaviest cuts to be taken right up to the point. This, coupled with exceptionally convenient handling arrangements, resulted in production in excess of that originally calculated on.

Driving and Supporting Work

In all of the machines engaged in this operation the work-holding devices are similar, consisting of a short driving arbor mounted on the spindle, and a pipe centre with a very slight taper which enters the nose end. The driving

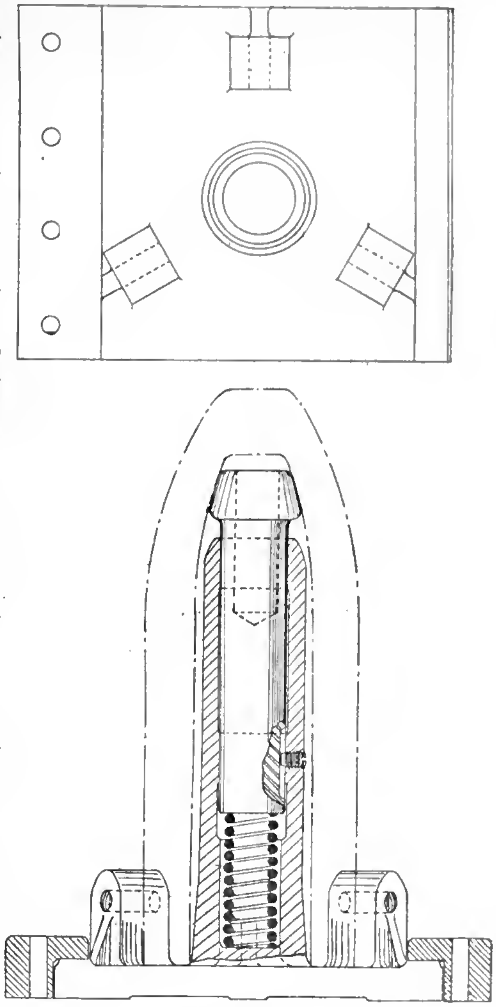


FIG. 7. ARBOR FOR SUPPORTING FORGINGS IN FIG. 4.

arbors are of the expanding dog type and, where the lathe spindle is hollow, they are actuated by a rod and handwheel. Fig. 8 shows an arbor as used, except that a solid spindle prevented the use of a rod as mentioned. To overcome this difficulty the body was cut away on opposite sides to allow access to the

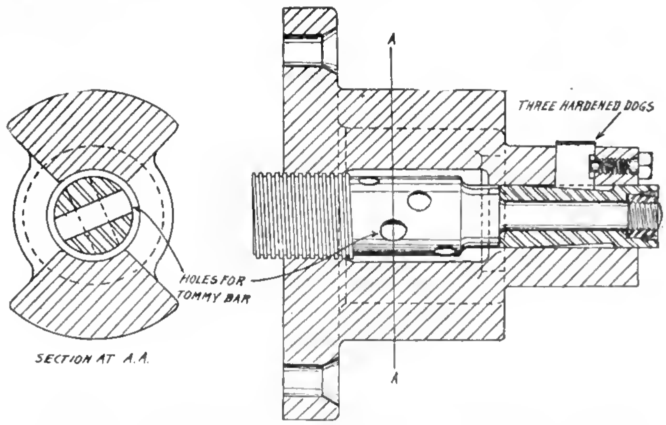


FIG. 8. EXPANDING DRIVING ARBOR USED IN ROUGH TURNING OPERATIONS.

square threaded spindle, which is turned by a tommy bar engaging with the holes shown. The movement of the spindle causes the tapered bushing to travel out-

wards and expand the dogs, these latter being retained in place by screws engaging with a slot in one end of the dog.

Up to this point all of the machine work, with the exception of a cutting off, has been done with reference to the interior surface as a locating base. The result of this is that the rough bore of the borings is sufficiently concentre with the rough turned exterior to insure a practically uniform depth of cut by the boring bar.

Machining the Interior

Boring and reaming, while classed as a single operation, are performed in separate similar machines with slight minor variations in equipment. The type of machine used is shown in Fig. 9, the design which was got out by the plant superintendent being strictly of the single purpose description. The shell is held in a long split sleeve chuck which grips it over the entire length of its straight portion, the interior surface of the chuck being relieved so as to make contact at the ends and prevent any working of the shell as the pressure of the tool travels along. The hollow spindle is large enough in diameter to receive the shell nose which projects inwardly past the chuck. Two speeds are provided by large diameter belt pulleys and suitable intermediate gearing, which transmits power to the spindle through the large spur gear on the rear end. The carriage is of the simplest possible design having a cross slide which carries a revolving turret with one bar. This bar is double ended, the cutting end carrying an inserted tool, and the other or controlling end carrying a roller which engages with a cam slot in the bracket at the end of the bed. This cam slot has a straight portion corresponding to the parallel body of the shell, and a curved portion of the same radius as the curve on the innerside of the nose. As the carriage feeds the cutting end of the bar into the shell, the roller on the controlling end travels in the slot causing the cutting end to follow a similar path.

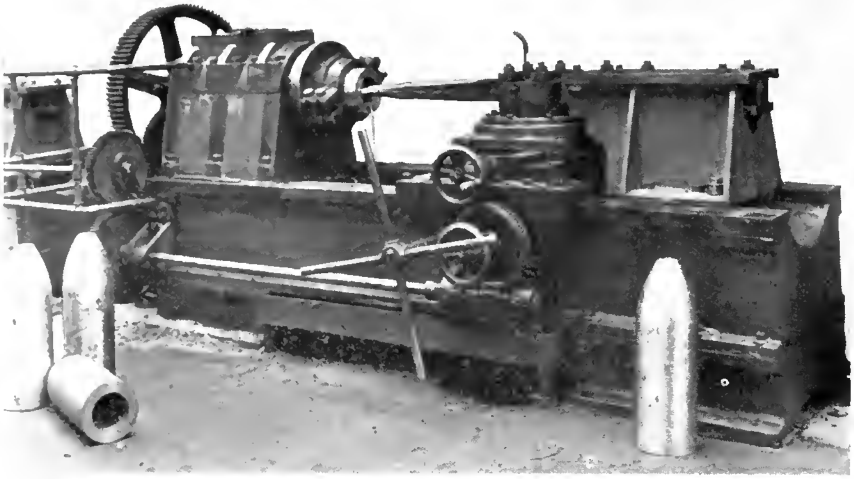


FIG. 9. SHELL-BORING LATHE WITH SWIVELLING BAR CONTROLLED BY PROFILE CAM.

Forming and Finishing the Curved Bore

By making the distances from the centre of turret, to edge of cutting tool and centre of control lever equal to each other, the centre line of the cam slot approximates very closely to the contour of the nose, the variation depending on the distance from the longitudinal centre line of the turret to the edge of the cutting tool. Cutting compound is conveyed through a tube inserted in the side of the bar and delivering it directly on to the cutting tool.

Reaming is excellently performed by machines of the same design in which the bar is controlled by a straight slot. The reaming head is of the double edge inserted-blade type, the blades having oval holes to allow of packing out for regrinding. Ample clearance space is allowed for the passage of chips, this being facilitated by introducing the cutting compound through the back end of the spindle, in liberal volume, which passes through the nose of the shell and obtains proper access to the surface being machined.

Insuring Accuracy of Final Turning

The shell is now provided with a bore of finished surface and accurate dimen-

FIG. 10. VIEW IN BORING DEPARTMENT.

sions and shape. If the hole in the nose be now bored out truly concentric with the bore, the shell can be suitably supported from the inside and finish turned on the outside. To finish bore the nose, the shell is placed on an arbor

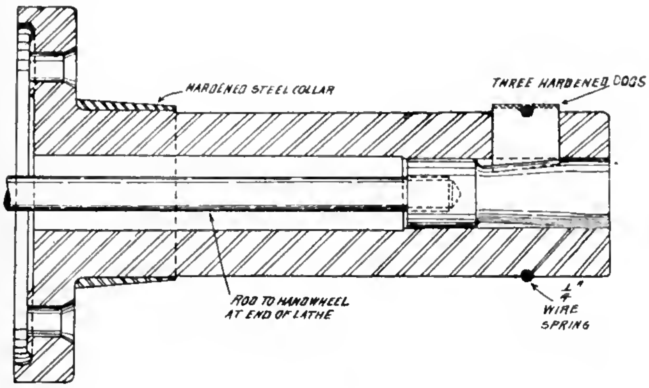


FIG. 11. SELF-CENTERING ARBOR ON WHICH SHELL IS MOUNTED WHEN BORING NOSE.

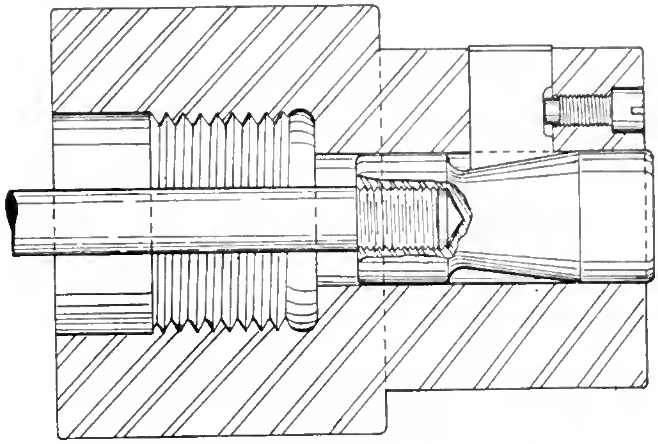


FIG. 13. THREE-DOG EXPANDING DRIVER ADAPTED FOR USE ON SPINDLE NOSE OF FINISHING LATHES.

as shown in Fig. 11. A hardened steel tapered sleeve at the base is made of a suitable size to enter the open base of the shell while three driving dogs at the point are expanded by a taper point on the end of the actuating rod which extends through the hollow spindle to a hand wheel.

A number of Bawden 16 in. lathes are engaged on this operation using the standard type of carriage with suitable tools. The hole is bored out to size ready for having the thread milled at a later stage, and also has the bevel edge formed on the mouth as called for by specification.

Finish Turning Outside of Shell

In finish machining the outside surface, the shell is supported at either end, being driven by the base which is carried on an expanding arbor, while the nose is supported by a pipe center as in operation 4, Fig. 8. This work can be efficiently accomplished on lathes of medium swing, 16 in. to 20 in. swing allowing ample space for former plates and other details of profile attachments which may possibly require space between the work and the carriage. The lathes in use represented a wide variety of design including 4 Bawden 16 in. manufacturing lathes, 2 Milwaukee 16 in. lathes, 1 C.M.C. 20 in. standard engine lathe and 1 Newhaven 18 in. lathe.

INTERESTING AIR LIFT INSTALLATION

THE air lift pumping plant described is installed at the National Transcontinental Railway yards, near the Quebec Bridge. The work was started in September, 1912, forty-three feet of 8-in. wrought iron pipe being driven from the surface to the rock, and from that point a 5-in. bore hole was started. The well was drilled entirely in shale, red and gray alternating. On September 30 a depth of 400 feet had been reached, and a rough pumping test yielded 200 Imperial gallons per hour. At 280, 520 and 700 feet respectively dry crevices were encountered, while at 775 feet water was struck in considerable quantity. The hole was then reamed to a diameter of 8 in., and a subsequent test yielded 3,200 Imperial gallons per hour.

At a depth of 980 feet, another water crevice was opened up, and at a depth of 1,012 feet drilling was discontinued. The whole well was then reamed out to 8 in. diameter. A large plunger pump was used for a 24-hour test, and with 400 ft. of rods in the well a yield of 5,400 Imperial gallons per hour was maintained. This pump was afterwards operated for eight days to clean out the well, and a sample of water was analyzed and re-

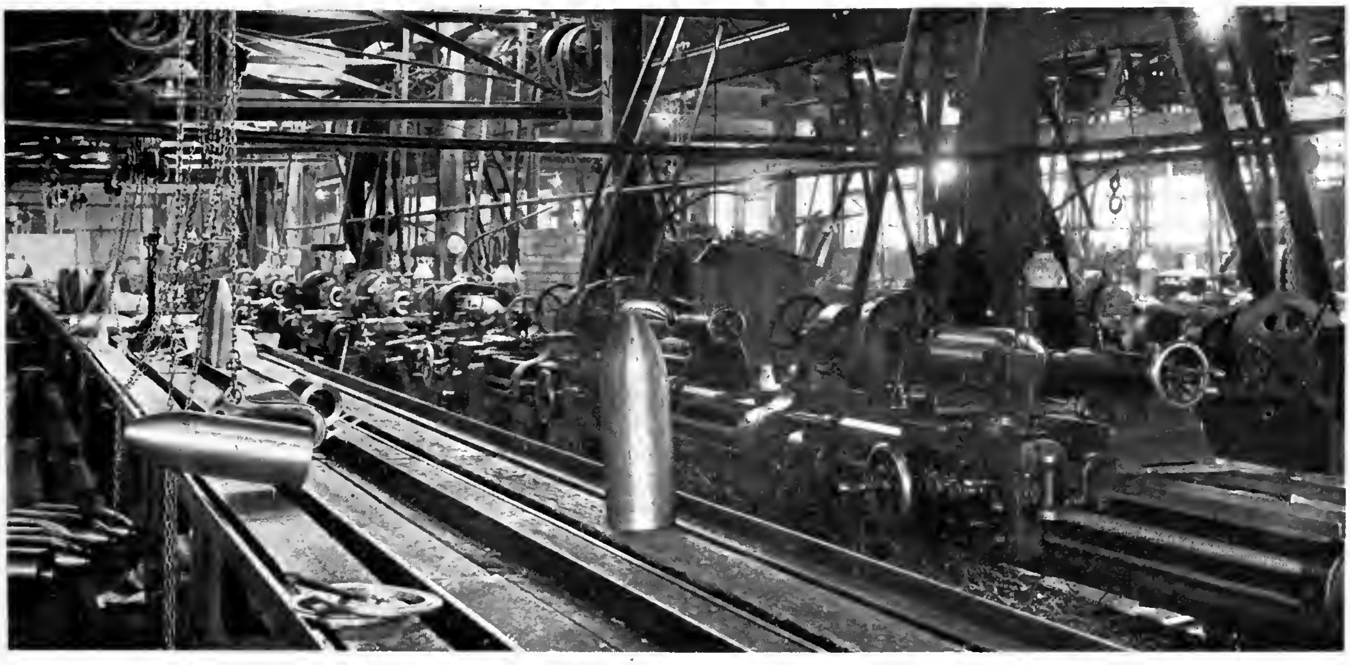


FIG. 12. VIEW IN FINISH TURNING DEPARTMENT.

ported satisfactory for both boiler and domestic purposes. When the well is not being pumped, water rises to the surface; but when being pumped to capacity it drops to a depth of 400 ft. from the surface.

A joint contract was awarded to the Canadian Ingersoll-Rand Co. and Williams & Wilson, of Montreal, for furnishing and installing a suitable pumping plant, the air-lift system being finally adopted because of its lack of moving or wearing parts in the water, and because the air-compressor could be located any distance away from the well.

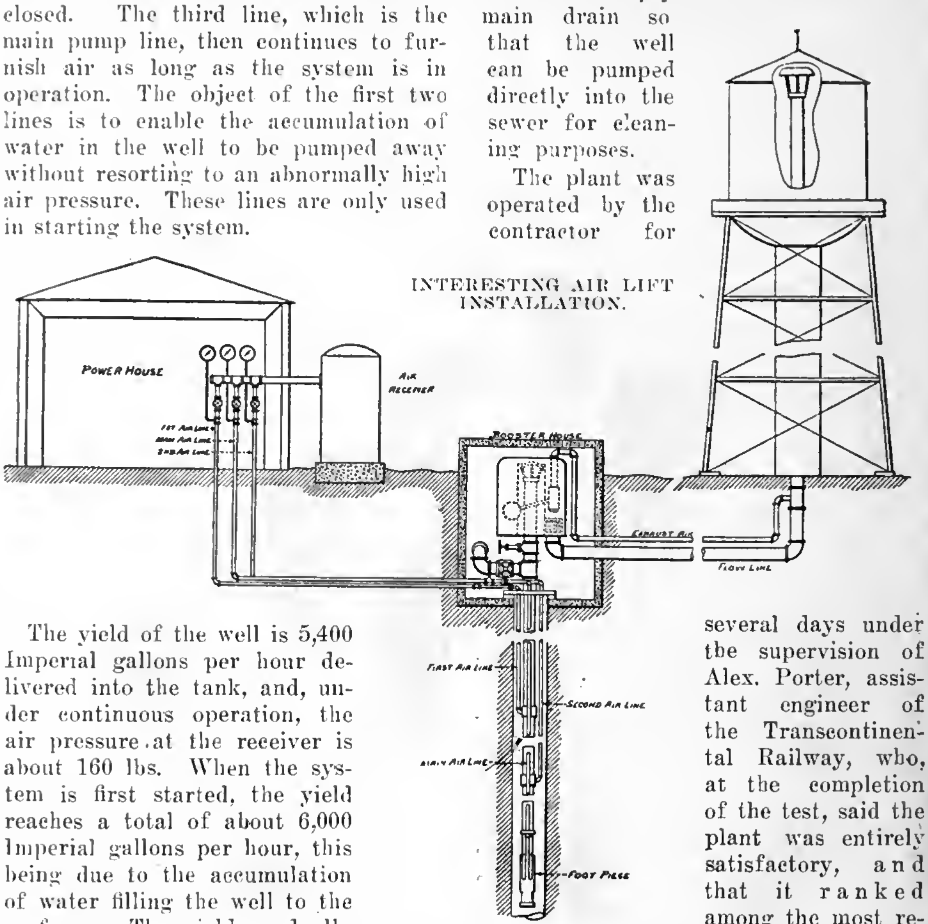
The air-compressor is a Canadian Ingersoll-Rand tandem compound, steam-driven machine, designed for a terminal pressure of 250 pounds, the air cylinders being fitted with a new type of valve known as the Cir-co-leaf valve, which is claimed to be absolutely noiseless in operation. The frame is fully enclosed, and the moving parts work in a constant flood of oil. A combined speed and pressure governor controls the compressor.

The air-lift foot-piece was manufactured by the Harris Air Pump Co., of Indianapolis, whose pumps are extensively installed throughout Canada. The column of water is carried by an air-jet situated below a choker, which arrangement eliminates slippage and causes the air to be distributed through the water in small bubbles. The booster pump was also furnished by the same firm.

Water is discharged into a steel tank 24 feet in diameter, and the total capacity, including the leg, is 61,170 Imperial gallons. The level of the water in feet is indicated by a register on the outside of the tank, by which means it is possible to accurately gauge the capacity of the plant. The tank is supported by a steel frame resting on a concrete base, in which are located the valves and connections to the service mains and to the main drain. Steam is furnished to the compressor at 110 lbs. pressure.

Owing to the depth to which the water drops in the well, three air lines are used, two being tapped into the water discharge line at different depths, and the third entering the Harris foot-piece. Each of these three air lines is controlled by a gate-valve in the power-house, the engineer operating the system without going near the well, which is 250 ft. from the power-house. A gauge over each line shows the pressure and indicates the fall of the water in the well.

Air discharges from the compressor into a high-pressure air-receiver and there to the well. The first air line starts the water flowing and continues to pump until the well lowers as far as this line is capable of lowering it. Then the first air line is gradually turned off until the second line begins to act. When this line has lowered the water as far as it is capable of doing so, the work is taken up by the third line and the second line closed. The third line, which is the main pump line, then continues to furnish air as long as the system is in operation. The object of the first two lines is to enable the accumulation of water in the well to be pumped away without resorting to an abnormally high air pressure. These lines are only used in starting the system.



INTERESTING AIR LIFT INSTALLATION.

The yield of the well is 5,400 Imperial gallons per hour delivered into the tank, and, under continuous operation, the air pressure at the receiver is about 160 lbs. When the system is first started, the yield reaches a total of about 6,000 Imperial gallons per hour, this being due to the accumulation of water filling the well to the surface. The yield gradually decreases under continuous operation until the normal capacity and pumping head are reached.

At the surface the water has to be pumped horizontally a distance of 60 ft., and subsequently to a height of 90 ft. into the top of the steel tank. For this work a Harris booster operates in conjunction with the air-lift. This booster consists of a steel tank resting on the top of the well-casing and receiving the water as it discharges from the well. The operating parts consist of a float and valve located inside the tank. The water and air are separated in this tank, the air rising to the top and maintaining sufficient pressure to force the water to the elevated tank. As the solid column of water discharges, the float drops, allowing the surplus air to exhaust from the tank. This whole operation requires only a few seconds, as a discharge takes place every time the booster is about two-thirds full. In fact, practically a constant flow is maintained.

The surplus air may be piped back to the compressor intake or discharged into the vertical riser to lighten the column of water and reduce the operating pressure. This latter plan was followed in the case of the plant at Quebec. The booster is automatic in operation and requires no attention. It also operates without noise. This apparatus is located in a concrete sump below the ground and is reached through a door in the roof. A by-pass is connected to the main drain so that the well can be pumped directly into the sewer for cleaning purposes.

The plant was operated by the contractor for several days under the supervision of Alex. Porter, assistant engineer of the Transcontinental Railway, who, at the completion of the test, said the plant was entirely satisfactory, and that it ranked among the most reliable of the various railway divisional pumping units. The high lift is a noticeable feature, amounting as it does to about 500 ft. vertically and 60 ft. horizontally. It demonstrates as far as it goes that there is practically no limit to the height to which the air lift will raise water if a fair amount of submergence is obtainable.

On a test recently made the plant pumped nearly 6,000 Imperial gallons per hour; but, as already stated, this capacity was due to accumulated water, and was, of course, only temporary. The normal capacity, 5,000 Imperial gallons per hour, was developed continuously after the level dropped to 400 ft., at which point the running pressure was 160 lbs. per sq. in.—Compressed Air Magazine.

T. E. Lewis, a British inventor, has patented an engine which he claims incorporates an entirely new principle. It is stated that this new engine retains its efficiency unimpaired in the case of gas, steam, oil, petrol, or air, and can be made a rotary or stationary type. It dispenses altogether with the use of cranks and connecting rods, while the speed attained and the regularity of movement are said to be phenomenal.

Canadian Shipbuilding and a Canadian Merchant Marine

By Col. Thomas Cantley *

The accompanying article embodies the substance of an address delivered at the recent Canadian Manufacturers' Association Convention in Hamilton. It is noteworthy because of its intelligent discussion of the dual subject of "Canadian Shipbuilding" and a "Canadian-owned Merchant Marine." The reasoning adduced is that derivable only from a broad, personal outlook and from a close personal study of past and present records of commercial and maritime countries. In the data given, there are not only all the elements constituting a stirring appeal for national action, but a wealth of educative matter that will rally support for the latter accomplishment with the least possible delay and the greatest effectiveness.

PERHAPS no enterprise, manufacturing or otherwise, is more vital to the Dominion of Canada today, and will become more so at the close of the war, than that of a well developed shipbuilding industry sufficient to meet fully our export requirements of agricultural, timber, mining and manufactured products. Our experience during the last year and a half should waken us to the danger that we run and the homage that we pay by dependence on foreign or other than Canadian ocean transport.

Our Atlantic Port Advantages

Our mail service has been interrupted, delayed and in a general way is poorer and less efficient than it was a generation ago. This is owing largely, of course, to so many British passenger liners being requisitioned by the Admiralty, but intensified by the fact that the passenger traffic of the Atlantic has been largely monopolized by the port of New York, notwithstanding the fact that Halifax, as recent events has amply proved, is an all-important national port from both a military and naval standpoint. It is ice-free, the safest on the whole Atlantic seaboard, the most commodious, the most certain and easy of approach, nearer to Southampton than is New York by about 680 miles, and 580 miles nearer to Liverpool—the shortened distance being an economic advantage of no small moment in these days of 40,000 and 50,000 ton, and 20 to 24-knot Atlantic liners. The shorter sea voyage means a saving of time to passengers, and is an all important matter as regards express freight and perishable commodities.

Our Resources Export Possibilities

If a free pathway across the seas is the first condition of the Empire's existence, as our Premier a few months ago so tersely told us, then it naturally follows that a national service of ships, both passenger and freight, to use this pathway is next in importance. Surely, then, it is time that both Canada and Great Britain became independent of foreign ports for the handling of its passenger, mail and freight traffic. In Canadian bottoms should be carried the product of this Dominion, and there should also be provided the ferry for bringing to our shores the enormous immigration which after the war will be lured to Canada by its wide diversity of opportunities.

Of the latter, mention may be made of the fishing possibilities, mining and timber resources of the Maritime Provinces; the market and truck garden possibilities of the Eastern Townships and other portions of Quebec, the stock-raising, and manufacturing possibilities of Ontario, the illimitable wheat fields of the Great Canadian West, and the mining, lumbering and fishing possibilities of British Columbia. The expansion of the Dominion from these and other sources must needs call for an ever increasing mercantile marine service. The export and import trade to and from the British Empire, our present Allies, and neutral nations of not only Europe, but the Orient, opens up a boundless prospect of big foreign business.

Our Foreign Shipping Dependence

Looking backward, it is perhaps difficult to understand why the Mother Country, and the Dominions composing the Empire, have for years been content to rely to so large an extent on Germany and the Scandinavian countries, for the transport of their passengers, mails, agricultural and manufactured products, and by so doing have thus played into the hands of their enemies and competitors. It may be said that this is one of the "after-the-war" problems—but even so it should nevertheless be tackled now. An efficient mercantile marine commensurate with Canada's requirements cannot be built in a day, or indeed in a decade, and it behoves us in Canada to view the situation fairly, meet the issue squarely and deal with it effectively.

U. S. Shipbuilding Growth and Decline

Perhaps at this point a short resumé of the growth and decline of the shipbuilding industry in the United States may be helpful in formulating a policy which we in Canada might adopt, looking to the fostering, growth and upbuilding of a strong, virile, shipbuilding and ship-owning industry. In looking into the experiences of our neighbors, we find that since 1789 the home trade of the United States on ocean, lake and river has been reserved for American vessels, and under this policy their coastwise tonnage had increased from 68,607 tons in 1789 to 6,852,536 tons in 1914. This, however, applies only to the home trade of the United States, as with the shipping registered for trade overseas it is very different.

U. S. Shipping Aids Granted

The first aid given American shipping was in 1789 when a discount of 10 per cent. was allowed off the Customs duty on all goods imported in ships built and owned by American citizens, and later a further Customs discount was granted on specific articles. In 1794 this aid was changed in form, but not in principle—the discount being abolished, but a surtax of 10 per cent. was added to the duty on all goods carried to the United States in foreign ships. As a result of these preferences, American tonnage registered for overseas commerce increased from 123,893 tons in 1789 to 411,438 tons in 1792. In 1800 this tonnage had further increased to 667,107 tons, and in 1810 to 981,019 tons. Thus national encouragement of the industry had quickly produced a growth and efficiency rather remarkable.

U. S. Shipping Aids Withdrawn

In 1815 the United States withdrew its surtax duties as against British ships in direct trade with the United Kingdom. Commercial treaties were entered into with Britain and other foreign Governments between 1815 and 1850 whereby ships of either nation were admitted on terms of equality into the ports of the other, so far as tariff and tonnage duties were concerned. In other words, the encouragement or preference given United States shipping in the early years of the American Republic was abandoned.

Further, about this time pressure was brought to bear on the American Government from the inland and agricultural sections of the country to withdraw the shipping aid and preference. This short-sighted, narrow, sectional and mistakenly selfish policy was effective, although the merchants and shipowners

*President, Nova Scotia Steel & Coal Co., and Canadian Manufacturers' Association.

who understood the situation protested strongly against such action. Notwithstanding the above, American shipping continued to grow slowly until 1850, the registered tonnage then being 1,435,694 tons, carrying 72.5 per cent. of the American overseas trade. Up to this time, of course, the competition had principally been in wooden ships. Steamboats were, however, gradually coming into use. Fulton created an efficient steam propelled vessel in 1807, but it was not until 1830 that steam vessels appeared in the American coasting trade. Iron ships were built at Bangor, Maine, in 1844 for the New England coast service.

British Subsidies

It was during this period that Great Britain invoked a new form of mercantile marine encouragement. In 1834 a subsidy of $85,000 a year was given to a British steamship company plying steam packets to Rotterdam and Hamburg, and another subsidy of $150,000 to a packet service to Gibraltar. This form of assistance was found to be so valuable in their influence on the then new art of steamship and engine building in the United Kingdom that in 1838 the British Government offered a large subsidy for a steamship service across the North Atlantic. In 1839 Sir Samuel Cunard secured a subsidy of $425,000 a year for a steam line from Liverpool to Halifax and Boston. This, it is understood, amounted to about 25 per cent. per annum on the cost of running the Cunard Line, and was given with the plain intention of establishing firmly in English hands the trans-Atlantic traffic. Other British shipping firms also secured subsidies for lines to South America and to the East Indies, and in a few years British subsidies totalled from three to four million dollars annually.

American Subsidies—Collins Line

For a time the American Government met British subsidy with subsidy. As an offset to the Cunard subsidized line, the American Government in 1847 concluded an agreement with the Collins line of trans-Atlantic steamers for a subsidy of $385,000 a year. When, later, the Collins Company built steamships larger than those of the Cunard, this subsidy was increased to $858,000 a year—the Cunard Company at the same time receiving $856,000 annually from the British Government. Under the impulse of these mail subsidies, American ocean steam shipping rose from 16,068 tons in 1848 to 115,045 tons in 1855.

Decline of American Shipping

Unfortunately for the American shipowners this beneficial policy on the part of the American Government was not continued. It has often been asserted that the decline in American ocean shipping began with the Civil War in 1861. This, however, is only a very superficial view, as the Civil War was only an incident in the decline. In 1855, or six years before the war, shipbuilding in the United States fell from 583,450 tons in that year to 156,602 in 1859. The causes of the decline were in part economic, but in much larger part political. In 1856 the American Government reduced the Collins mail subsidy from $856,000 to $385,000 (the Cunard line were then receiving $856,000). In spite of this drastic reduction the Collins line continued in the service, but the British competition was too keen, and they were forced to quit the field.

Just here it might be noted that in 1860-61, when the American Government were withdrawing assistance from their shipping, Great Britain was expending $1,537,223 in the encouragement of steamship building and mail communication with all parts of the world. France, following the British example, in 1858 offered subsidies of $620,000 a year for a line from Havre to New York, and further large amounts for other lines. About the same time Germany began to subsidize the North German Lloyd on the routes from which the American merchant ships had disappeared.

For a short time after the Civil War, American ocean shipping actually increased, the registered tonnage in 1867 being 1,515,648 tons. It remained at about the same figures for a decade thereafter, but in this same period the proportion of American imports and exports carried in American vessels decreased from 33 to 26 per cent. In 1898 the registered tonnage had fallen to 726,213 tons, or less than half of what it was 31 years previously, and the proportionate carrying capacity to 8 per cent. From 1898 there was a gradual yearly increase, and in 1914, at the outbreak of the great war, this tonnage totalled 1,066,288 tons, although still carrying only about 8 per cent. of the American imports and exports.

In 1891 the U. S. Congress passed the Ocean Mail Act, providing subsidies for postal lines, and, while the subsidies paid under this Act have not been large, totalling in 1914 $1,039,360, of which $673,998 was received by the American Transatlantic service, this aid has proven to be of substantial value to the American mercantile marine.

Panama Canal Act

The Panama Canal Act of 1912 changed the traditional policy of the United States by offering free registry for the overseas trade to American-owned foreign-built vessels not more than five years old. This policy up to 1914 had not been successful. Shortly after the outbreak of the present war, in August, 1914, the U. S. Congress passed an amending Act whereby American-owned foreign-built vessels could be admitted to American registry irrespective of age. At the same time the President was authorized to suspend the requirements of law that the officers of foreign-built vessels should be American citizens, and to exempt the ships in question from compliance with American inspection and measurement laws and regulations. Even this has not had the desired effect.

Comparative Wages Paid

The wide difference in wages and maintenance between American and foreign vessels is one of the chief difficulties encountered, and this is clearly illustrated in the following table, which details the comparative wages in 1914 on American and British cargo steamships of about 5,000 tons capacity:

	American. Wages per month.	British. Wages per month.
Master	$179	$100.00
First officer	90	63.18
Second officer	70	43.74
Third officer	60	....
Carpenter	40	31.59
Boatswain	35	29.16
Quartermasters	35	....
Sailors	30	24.30
Chief engineer	150	97.20
First assistant engineer	100	68.04
Second assistant engineer	90	48.60
Third assistant engineer	80	....
Oilers	40	....
Donkey men	40	32.50
Firemen	35	29.16
Coal passers	30	....
Steward	60	38.88
Cook	45	34.02
Messmen	20	15.00
Cabin boy	20	....

Total American crew, 32 men. Total British crew, 27 men.

Total American payroll per month .... $1,655 Total British payroll per month $994.66

Undoubtedly wages have increased rapidly during the last two years, but the proportion is still about as above. To meet the higher cost of operation and maintenance it has been recommended to the American Government that graded subsidies be granted sufficient to offset the difference in cost of operation between American and foreign vessels, with the condition that these vessels should be so constructed as to render efficient service as transports, etc., in time of war.

Foreign Subsidies

In the fiscal year 1914, the United States paid as subsidies to American steamers under contract the sum of $1,089,361. The following table gives a summary of the amounts paid by way of subsidies, mail pay, bounties and other means to the mercantile marine of the European nations. The figures are for 1909, being the latest officially available:

British Empire	$9,689,384
France	13,423,737
Japan	5,413,700
Italy	3,872,917
Spain	3,150,021
Austria-Hungary	2,984,530
Germany	2,301,029
Russia	1,878,328
Norway	1,102,143
Netherlands	880,011
Sweden	277,752
Denmark	145,000
Belgium	55,970
Portugal	50,000

The growth of German shipbuilding was brought about by application to it of the general protective system of the country, and partly by liberal subsidies. As a result, within 25 years the net tonnage of the ships registered in the two ports of Bremen and Hamburg had increased from less than 230,000 tons to nearly 2,000,000 tons. In addition to subsidies, Germany grants preferential rates on her State railways on cargoes to be carried in German ships.

France ten years ago established a shipbuilding bounty equivalent to $28 per gross ton for steel steamers, this rate being subjected to a gradual reduction of roughly $1 per ton yearly—the present bounty paid being $19.50 per ton.

In Austria a bounty of $8 per gross ton is paid on all steel steamers constructed in that country.

The steel shipbuilding bounty paid in one year in France exceeded $2,000,000; Japan the same year paid total bounties of $997,700; Italy, $886,266; and Austria-Hungary, $850,000.

Largely as a result of the special aid given the shipbuilding industry by the different maritime nations, the growth of the various merchant fleets has been remarkable. The following table from the records of Lloyd's Register for the years 1895 and 1915 illustrates this growth:

	1895. Tons.	1915. Tons.
Great Britain	13,242,630	21,045,049
United States	2,164,763	5,388,194
Austria	394,970	1,055,719
Denmark	356,714	820,181
Holland	446,861	1,496,455
France	1,094,752	8,319,438
Germany	1,886,312	5,439,296
Italy	778,941	1,668,296
Japan	301,101	1,768,386
Norway	1,650,012	2,304,726
Russia	487,681	2,658,628
Spain	554,238	1,095,828
Sweden	497,577	1,118,086
Canada (1894 to 1914)	868,624	932,422

British Columbia Marine

British Columbia has already taken a forward step in the development of a mercantile marine by the introduction in the local Legislature of a bill to encourage the building and operating of British Columbia ocean carriers. This measure provides for the lending of 55 per cent. of the cost upon vessels hereafter built in the province and used exclusively in carrying products to and from British Columbia ports. The loan shall not be for more than 55 per cent. of the ascertained value of the vessel, construction of which shall be commenced and completed within twelve months of the coming into force of the Act, the purpose being for the carriage of freights upon ocean routes. Loans are to bear interest at the rate of 6 per cent., payable half-yearly.

In further aid of the shipbuilding industry of the province a subsidy is to go to the owner who actually pays for the construction of ships, or to his assignees who actually operate them, but not to any middleman or promoter, and up to a number not exceeding twenty ships, in ten annual instalments, so computed as to bring the net earnings of the ship up to 15 per cent. on the actual cost, but never more than five dollars a ton dead weight capacity, the initial instalment to be paid in the first year after peace is declared. Shipbuilding plants may be aided by the guarantee of securities for not over 55 per cent. of the actual cost of the plant. A commission is appointed to supervise the administration of the Act.

It is reported that, as a result of this aid, the Wallace Shipyards of North Vancouver have booked orders for the construction of three steel vessels, the hulls to cost about $400,000. The boats are to be used in the lumber carrying trade from British Columbia ports, and are to be built under an interest guarantee of the British Columbia Government.

Suggested Shipbuilding Commission

Some time ago the New York Chamber of Commerce, a very influential body, put forward a scheme which it thought might well be adopted as the shipbuilding policy of the United States, and Sir George E. Foster, Canadian Minister of Trade and Commerce, in discussing the question of ocean transportation in the House of Commons, on April 26, outlined this scheme, and commented on the way it might be applied to the Canadian problem. Sir George Foster's translation is somewhat as follows:—

The Dominion of Canada would appoint a commission, consisting of, say, three members of the Cabinet, whose departments are interested—say, Commerce, Navy and Finance. The Government side of that commission would be the Ministers of these three departments. Add to these a naval instructor and three practical and experienced men in shipping matters, selected by the Government, and you have the commission which would operate in Canada. That commission would have general oversight and direction of the classes of vessels to be built under the scheme, how they should be manned, everything in connection with them, and to the extent that it would be possible, the regulation of the rates as well. The commission would then be empowered to enter into contracts with shipbuilding companies to build according to the plans and regulations laid down in Canadian shipyards, and the shipbuilders would be allowed the difference between the cost of construction in Canada and in European ports, that difference having been carefully ascertained by the commission.

Nature and Duration of Subsidy

The object would be to enable Canadian shipowners to have their ships built in Canada at exactly the same cost as if they had them built in a European plant. If this tonnage could be built in a European plant at a certain percentage per ton cheaper than in Canada, then the subsidy for construction would be that difference in cost, whatever it was, so as to put the Canadian shipowner on

an equality in the after competition with those having ships built in European shipyards. The time to carry this out would be limited to a period of, say, ten years, during which the operation of building would go on.

The commission would then be empowered to enter into contracts with the shipowners, when the ships were built, and to guarantee to the owners the difference in cost of operating the ships under the Canadian flag and under a European flag, that subsidy to continue for the life of the ship. The commission would ascertain the difference in cost of construction and operation and pay that difference alone. In that connection the Government would place at the disposal of the commission the sum of $15,000,000 or $20,000,000, and empower the commission to guarantee the bonds upon the ships built up to 50 per cent. of the value of the ships. Such bonds would be 5 per cent. bonds, and the Government commission would get one-half of 1 per cent. on these bonds returned to its treasury for its work and its supervision.

Such is the plan of assistance outlined by Sir George E. Foster, and, while we think a simpler method would meet the case, we note with pleasure that the matter has had the attention of our hard-working Minister of Trade and Commerce.

Steel shipbuilding can be devoloped on a broad, comprehensive and permanent scale, provided the Government of Canada deals with the matter on broad, statesmanlike and business lines. Ten to fifteen years will be necessary to build up an organization of skilled workmen, possessing the necessary experience to enable us to compete successfully with foreign countries, and during this adolescent period the fostering influence and stimulation of Government protection must be afforded. If ships built outside of Canada, either in Great Britain or in the other overseas Dominions, are to be admitted free to Canadian registry and trading (and we cannot well refuse such), then at least an amount equal to the duty imposed on the material entering into the Canadian-built ships should be returned to the builders.

The Japanese Policy

After consideration of the various policies adopted by practically all civilized nations, it would seem to us that in view of the present situation in Canada, perhaps the system adopted by Japan is that best calculated to meet our needs at the present time. During the twenty years the commercial fleet of Japan has increased from 360,695 tons to something like 1,500,000 tons. Practically all the ocean mail ships acquired by Japan in the last five years have been built at home, and these are vessels of some 8,000 to 13,500 tons cargo capacity. This large increase in tonnage was brought about by a shipbuilding bounty of $10 per ton for steel steamers over one thousand tons gross, and where these were engined with Japanese built machinery $2.50 per indicated horsepower was added to the bounty. The splitting up of the bounty as to hull construction and machinery enabled the Japanese Government to, in effect, give a larger bounty to the faster and higher powered boats necessary for passenger and mail service. Whatever system of encouragement is adopted by bounty or otherwise, should be for a stated period of years, not less than ten and not exceeding fifteen.

Marine Insurance

The next requisite to a successful Canadian shipbuilding and shipowning industry is that of marine insurance. A great deal has been heard in the past half dozen years as to the alleged unfair treatment of Canada by both Lloyd's and the British insurance companies in the matter of St. Lawrence and B. N. A. marine insurance rates, and Canada has had ample and grave reason for dissatisfaction in that connection. The fact is capable of ample demonstration that Norwegian shipping, through their system of mutual marine insurance, which has been in effect for many years, have covered all their risks, including B. N. A. and St. Lawrence trading, with an average premium rate of slightly under five per cent., and this has prevailed not for one year or a few years, but over a period of more than a decade. This rate is approximately one-half that charged a similar type of tonnage when engaged in like traffic by Lloyd's and British marine underwriters on vessels engaged on B. N. A. and St. Lawrence trade.

This difference in the cost of marine hull insurance is practically a profit in itself, and when there is added to it a very great difference in the cost of cargo insurance, as compared with the American Atlantic ports of Portland, Boston, New York, Philadelphia, and Baltimore, these differences run up into really enormous figures. A mutual insurance scheme on lines somewhat similar to that of Norway might be brought about by a marine insurance board or corporation, on which would be represented the Canadian Government, the Shipping Federation, a representative of the combined Boards of Trade of Halifax, St. John, Montreal, Toronto and Winnipeg.

The experience of Norway and other countries who have adopted a mutual system of insurance and the rates of premium, which experience has shown to be necessary over a period of years, might be taken as a basis for a scheme of this character. One essential would be that all steam vessels engaged in the coasting or foreign trade, built to Lloyd's, British Corporation, or Bureau Veritas classification, would be eligible for and compelled to take out marine insurance to the extent of not less than 75 per cent. of the vessel's value—the premium being variable as to age, character and equipment of the ship. All Canadian tonnage could be grouped in, say, three or four scales of classification for insurance purposes. All Government vessels engaged in lighthouse, patrol, and such service to be included.

Harmful Legislation

It is also essential that the shipping interests should not be handicapped by visionary or vexatious legislation affecting the manning or working of our merchant tonnage. The bedevilling influence of American legislation in this connection has perhaps done more than anything else during the last decade to prevent the expansion and successful operation of the American mercantile marine.

Inspection

In the matter of classification and inspection, Canada stands to-day in an anomalous position. A ship is built in the United Kingdom, has passed Lloyd's and Board of Trade inspection, and carries certificates to this effect, notwithstanding which on entering Canadian trade she is forced to undergo Canadian inspection at a needless loss of time and considerable expense. A reciprocal arrangement must be arrived at whereby British, Overseas Dominion, and Canadian certificates as regards seaworthiness and efficiency shall be mutually accepted in all British Dominions. To continue as we are doing in this connection is idiotic in the extreme, and calls for prompt remedy by those responsible.

Canadian Mercantile Marine

The merchant marine, the building and operation of which is or should be a great national industry, is quite as deserving as any other Canadian industry of the friendly interest of the Canadian people and the intelligent consideration of our Government. The successful operation of an adequate Canadian merchant fleet is as vitally important to the prairie farmer as to the Ontario and Maritime Province manufacturers. Every mercantile nation in the world, carrying on an export business of any moment, demands a suitable fleet of its own nationality. Great Britain's merchant fleet of necessity antedated its overseas trade. Germany, when it first began to look abroad for markets, refused to depend upon British ships, but sought at once the creation of a German merchant fleet. France, laboriously wrought its own merchant marine, and Japan, the latest of commercial powers, secured its ships first and its trade afterwards. Not one commercial nation—save the United

States—has ever been willing to trust its foreign trade transport service to competitors—the instinct of self-preservation forbids such a policy.

We in Canada have a great coast line with ice-free harbors on both our Atlantic and Pacific shores, and numerous sites suitable for the establishment of shipyards. We can to-day supply almost all the raw material required, and granted sufficient encouragement, can produce all of it within a year. Taken in conjunction with the present abnormal demand for ocean tonnage, and the almost certainty that this will continue for several years at least, all these things constitute an opportunity for Canada which it would be folly to now neglect. To profit by these favorable circumstances it will be necessary to move quickly. If the Canadian Government will at once announce a comprehensive, broad and effective policy, granting sufficient encouragement to shipbuilding, we believe that the whole country, from the Atlantic to the Pacific, including all the territory that lies between, would approve their action. Never before was the necessity so great or the opportunities for meeting it so exceptional. Let us have action.

NEW POWER SUPPLY FOR HYDRO

AS a result of the recent conference held between members of the Federal and Provincial Governments, at Toronto, Ont., Sir Adam Beck, and representatives of the private power companies at the Falls, the Hydro-Electric Commission will in the near future, it is understood, have an additional 32,000 horse-power available to supply the demands of Ontario municipalities.

Although no contracts have been signed yet, and no price agreed upon, it is believed that the extra supply of power will be secured at a lower price than the commission has been paying for the emergency supply from the Electrical Development Co. The power will be supplied by the Canadian Niagara Power Co., which has hitherto been exporting the bulk of its power.

Until the new supply is available, the Hydro-Electric Commission will be unable to furnish any extra power to corporations under contract. At the present time every bit of the hundred thousand horse-power the commission has a right to demand from the Ontario Power Co. under its contract is being used. In fact, the peak load would be some 7,000 horse-power above that mark, but for the arrangement by which municipalities cut down their consumption at certain hours. It is stated that the commission could immediately dispose of at least 5,000 horse-power at once if it were available. The additional 32,000 h.p. will be obtained from the Canadian Niagara Co.

LITTLE KNOWN FACTS ABOUT GRINDING-CENTRES

By Howard W. Dunbar.

NO work can be ground more accurate than the centres in same, nor any nearer round or more perfect than the centre points that the work revolves on. It seems to be common practice, especially by grinding machine users, to make light of the necessity for accurate and well-made centres.

In observing methods employed in various factories, both large and small, this fact has been noticeable. Work has been observed in grinding machines in which the centre hole had no relief drill at the bottom of it, and instead of the angle of the centre fitting on the angle of the centre point, the work was revolving on the rounded nose of the centre in the machine, and wobbling about in the centre hole.

Other work has been observed in which the centres have been neither round nor of same angle as the centre in the work, and the surface of the centre hole has been rough, and full of lines and chatters made by the point of the drill used, instead of smooth and perfect as it should be when proper tools and proper machine operations are used.

We have seen grinding machine users lubricate the centre points and centre holes with red lead. This in itself is all right for lubricating heavy work, but when the red lead is mixed with equal parts of core sand and steel chips (as was the fact in the case in mind) accurate work is impossible. A little chip or foreign matter in the centre hole or on the centre is very apt to defeat very good intentions for nice work; therefore, it is necessary to keep the centre holes not only perfect and true, but also clean and free from foreign substances which would cause inaccurate work.

Centre holes should be made in size nearer in proportion to the size of the work being ground. Tradition, operators, foremen, and even superintendents will say that this is not correct, and that large centre holes will look bad, or are not necessary. Nevertheless, the truth remains; good work can only be ground on large, well-made centres and centre holes.

The centre points in the machine should be ground accurately, using the centre grinding attachment whenever the slightest imperfection in them occurs, and should always be ground when an exceptionally nice piece of work is to be finished in the machine. None of us would ever trust the weight and strain which we impose upon these small centre points by the use of too small centre holes in the work in any machine or in any operation, where we were expecting to carry a heavy load or do a lot of production. However, work has been observed in a grinding machine weighing several thousand pounds, resting upon too small centre points, in which less than 7-16 in. of the surface of the centre point carried this load.

Of course, it is useless to expect work to be ground accurately when the centre is not strong enough nor large enough to support the weight with a good, generous factor of safety. A good rule to follow is to keep the centres properly ground and hardened, at the proper angle, and smooth in finish, and to use just as large and just as well-made centre holes in the work as is possible, when refinement and accuracy are desired.—Grits and Grinds.

WAR TAX COLLECTION

NOTICES are being sent out by the Finance Department to companies and firms in every part of Canada requiring them to make returns under the provisions of the business tax imposed at the last session of Parliament.

Some 15,000 such notices are being issued, which means that approximately this number of companies and firms will be required to contribute a large slice of their excess profits made since the war. For the purposes of the tax the country has been divided into eleven districts—two in Quebec, four in Ontario, probably one in Nova Scotia and Prince Edward Island, one in New Brunswick, one in Manitoba, one in Saskatchewan and Alberta, and one in British Columbia.

The tax is 25 per cent. of all profits made since the war in excess of seven per cent., in the case of incorporated companies, and 10 per cent. in the case of firms, individuals and partnerships.

DYESTUFFS INDUSTRY

ACCORDING to the Iron Trade Review, Cleveland, Ohio, Dr. Norton, the author of a report on the present dyestuff situation issued by the Bureau of Foreign and Domestic Commerce, has expressed the opinion that the United States is to have a permanent dyestuff industry. The textile and allied industries, he says, are united in the determination that the country shall not again be exposed to such a famine as it has recently experienced. The large organizations of dyestuff users have expressed a willingness to bear the burden of higher prices than prevailed before the war, if necessary. Most of the companies engaged in manufacturing coal tar compounds are planning to continue their production along the lines already taken up and to enlarge such production, or enter upon the manufacture of additional intermediate or primary dyes, as circumstances warrant.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

AN ANCIENT SOLUTION OF A MODERN PROBLEM

By A. L. Haas.

IN the desire for easy machining and in the modern tendency to reduce complexity even by neglect of economy in material, factors of considerable importance may be overlooked.

Take for example a high speed vertical engine running at 800 to 1,000 revs. per minute, it is obvious that all material in the moving parts must be of the finest quality. To this end the material for piston and connecting rods and crankshaft is duly tested, yet the curious fact remains that failure of connecting rod bolts is the most common cause of a wreck. The material for these bolts is rarely specified, they are frequently made from bar material and as they are only bolts they get less consideration than they deserve. Often they are made of high carbon steel to reduce weight. The rod material on the other hand whatever its tensile strength has to fulfil exacting requirements with regard to extension and reduction of area under test.

Where the Danger Lurks

Granted suitable material, a more pertinent question which is never specified arises in the machine shop. Few turners are aware that sharp square corners at a shoulder cannot be produced except by undercutting the material at this point and so reducing its diameter. In a desire for perfect finish under the head this reduction of cross sectional area is almost invariably found in the bolts mentioned.

There is no need to labor this point to anyone experienced in breaking tensile specimens or to point out the danger of even minute nicking at a change in section. This combination in the case of steel will take tons per square inch away in the tensile result, while if combined with shock stress disaster is cordially invited in practice.

Another point concerns screw-cutting in the lathe. As such bolts are finished all over, and are considered good work it is usual practice to finish them in an engine lathe.

In screwcutting the breakage of all tool points is caused in the withdrawal of the tool at the end of the cuts. A cut thread in the lathe is considered superior to one cut by dies. The sharp nick left at the end of thread has exactly the same effect as an undercut shoulder under the head, it invites breakage. In the case of die cut threads such nicking is less evident since the thread has an effective taper at the end. Working a bar of uniform section must, however, punish the dies and lessen their life.

A Feasible Contention

It is a little curious that a desire for the best possible article made in the most expensive manner should lessen its strength; but such is the contention now advanced, it is thought with due reasons, in the case of uniform diameter bolts. It explains also why black commercial bolts do not fail so unaccountably as a carefully made lathe job.

The remedy for both defects is the same:—The provision of a distinct radius under the head of the bolt and a radius clearance for the thread tool. Using a turret lathe the clearance for thread can be made by the cross slide parting tool suitably shaped. A circular groove round in shape is the desired clearance for the thread tool. Such a groove the depth of thread only may at first sight look odd but does not weaken the bolt. Where the thread tool usually finishes is a point that the chaser cannot be expected to finish properly.

The connecting rod bolt illustrated obviates both defects, it has a radius under the head, the brasses being finished in a similar manner, the stem is reduced in diameter to allow the threading tool to pass into clearance when screw-cutting.

Design Established by Age

The design is as old as the proverbial hills, but the modern machine shop is apt to consider its product from its own point of view without regard to other questions. Granted access to a testing machine the matter can easily be put to the proof. The dangers are more obvious in the case of steel than of wrought iron. Taking an analogous case, that of small screw blanks headed cold, if no radius under the head is provided either by design or wear, the enfoliation produced makes heads which almost drop at a touch. If, however, such radius is present, the head may be battered with a hammer and turned over square to its normal position without fracture.

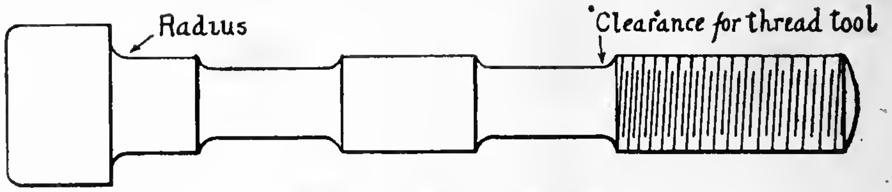
Because a piece is machined and not deformed, the point at issue is overlooked while small size bolts to-day fulfil relatively high missions in the case of automobile and aeroplane engines. The temptation open to make these in automatics without reference to the points raised may lead to fatality.

A recent failure from this cause wrecked a high speed engine driving a 700 k.w. generator and shut down half the product of a factory engaged upon important work. The damage a broken bottom end bolt can cause must be seen before the effect of momentum and high speed can be realized.

Trifles Cause Damage

Such considerable results, however, can accrue from neglect in the machine shop and show that the veriest trifles can overset hundreds of pounds worth of careful work. Such minutiae are, however, basic facts for the engineer to consider and they place a large responsibility upon the mechanic.

The matter is of supreme importance wherever steel is employed in the connection indicated and if considerable stress is here laid upon what is a simple matter, it is because in spite of the facts being well known they are repeatedly neglected.



CORRECT DESIGN OF ROD END BOLT.

More than one large steamer has limped to port on less than half speed with a cylinder cover gone up through the skylight owing to the cause cited. Numerous failures of high speed generating sets can also be attributed to the same reason. Examination of the spare bolts usually supplied and the type of fracture destitute of any reduction of area or apparent elongation in the material will testify to the facts of the case.

Frequently the material of bolt is described as rotten because of the sudden short character of the break showing no apparent flaw. The entire responsibility is, however, upon the machine shop for the radius under the head, while the draughtsman may take his share in the design of the bolt where the break occurs at the end of the thread. A large factor of safety seems of no value, and many engines now working are a public but unrealized danger owing to the bottom end bolts.

GETTING THE MOST FROM HIGH SPEED DRILLS

by J. R. Hamilton

IN addition to such essential features as the proper method of grinding the cutting edges of twist drills, the speed and feed at which they should be operated, it will be found that better results will most often be obtained after the drill has become warmed up. While it is never advisable to run a drill too hot, it must be remembered that twist drills, especially those made from high speed steel, can be operated to better advantage after they have attained considerable heat, at which point they become much tougher and consequently stand up to a heavier feed. When cold, high speed steel is often quite brittle and easily broken; for this reason, care should be exercised in cooling the cutting point of twist drils after they have become over-heated, as there is a possibility of creating minute cracks when dipping the drill in cold water.

This fault often results from careless grinding by an inexperienced operator. In an effort to get the drill ground quickly, excessive pressure is used, and the point quickly becomes over-heated, often to the extent where the color is drawn. The workman, not realizing the harm done, will immediately dip the point into a bath of cold water, when the sudden chilling of the keen edges will cause small cracks, so small as to be imperceptible with the naked eye, but which may result in the edges chipping when the drill enters the metal. Unless great care is taken, the forcing process of grinding will generally result in a cutting edge too soft or too brittle. It is sometimes profitable to preheat a twist drill before starting on a job. Do not let the drill become too hot, and, when cooling, use tepid water to avoid sudden chilling of the thin cutting edges.

GETTING A JOB DONE QUICKLY

by R. James

MACHINE shop practice often requires that certain work be performed in as short a period of time as possible, in order to avoid unnecessary delay in the operation of another machine or section of a workshop. To successfully accomplish this, it is necessary that the workman should be entirely familiar with the machine he is operating, and also have an exact knowledge of the work he is doing. Sometime ago, while passing through a small repair shop, I noticed a young fellow working on a shaper with the cutting tool travelling about 2 inches over each end of the work. As the length of the piece was about 4 inches long, it appeared to me that he was using an extra long stroke to complete the cut. After watching him for a few moments, I stepped up and asked him what his object was in having such a long stroke on that length of cut. Justifying himself, as it were, the chap replied "Well you see, the boss wants this job in a hurry, so I am cutting a little fast."

Thinking to enlighten him I asked, if it would not be better to shorten the stroke and throw the belt up on a higher speed; but he seemed surprised and said, "The tool would not stand the higher speed." He did not seem to realize that by shortening the stroke and using the next speed, that the tool would be operating at practically the same rate, yet accomplishing the job in much less time. To convince me—as he thought, he finally reduced the stroke and threw up the belt, expecting, I believe to see the tool begin to smoke. However, he was agreeably surprised to see things running smoothly and the metal coming off nearly twice as fast. The next time he has a job to do in a hurry, he will likely use his head as well as his eye.

SPECIAL VISE JAW SAVES MAKING DRILL JIG

By F. H. Mayoh

IT is the custom when drilling a number of duplicate parts to make up a jig for guiding the drill so the pieces will be drilled alike. These jigs are apt to be

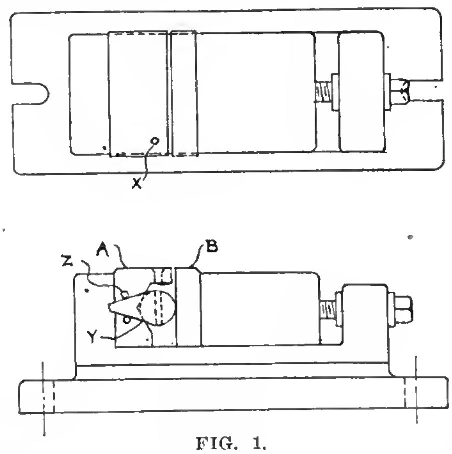


FIG. 1.

more or less expensive depending upon whether or not the part drilled is complicated or easily adapted to being gripped.

By the accompanying sketch Fig. 1 is shown a method which sometimes can

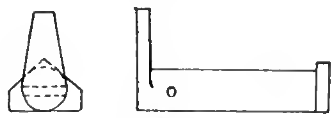


FIG. 2.

be used to eliminate or save the expense of making a jig. This illustration shows the plain vise such as is used on the milling machine fitted with a special vise jaw A, this jaw has a hole at X for guiding the drill while the vee Y centralizes the work which is gripped by the jaw B, which is a standard jaw.

The work is illustrated in the sketch Fig. 2, and the method of gripping is obvious as the round portion is gripped in the manner described and the drill is fed through the hole X into the work and each piece will be in duplicate. This jaw has two pins Z for locating work radially from the shaped end.

VALUE OF BELT TIGHTENERS

Professor William W. Bird, of Worcester Polytechnic Institute, with Francis W. Roys, have been experimentally investigating the effects of atmospheric humidity upon oak tanned leather belting, with the following definite conclusions:

1.—If a belt be set up at a low relative humidity, slipping will occur with a marked rise in the humidity, especially if it is accompanied with a rise in temperature.

2.—If a belt be set up at a high relative humidity, excessive stretching and excessive pressure on the bearings will result from a decided decrease in the relative humidity, especially if accompanied by a fall in temperature.

3.—If a belt be set up at a medium relative humidity the tensions will not be excessive at low relative humidities nor will there be any great danger of slipping at high relative humidities unless accompanied by excessive temperature changes.

4.—If a belt be set up at any relative humidity with a spring or gravity tightener, a load 50 per cent. greater than the standard can be transmitted at either high or low humidity without any of the troubles.

PROPER WIRING AND MOTOR PERFORMANCE

THE superintendent of a sash and door factory, where electric motors are used for driving the machines says he finds something new all the time. He finds that proper wiring has much to do with the satisfactory performance of motors. For instance, an 8 horse-power motor did not do the work required, and he was about to exchange it for a 12 horse-power motor. After the new motor arrived he was told that the wire would have to be changed, as the one in use was too small for the necessary current. The wire was duly changed, but for lack of a coupling, the old motor was connected, to be used until the coupling arrived. To the surprise of the superintendent the old motor did the work as well as could be wished.

TRANSMISSION SAFETY—I.

AN important factor in securing freedom from accidents in machine shops and factories generally is the proper safeguarding of the apparatus used for power transmission. In a large shop that does not have individual electric motors for its various machines, a great many belts are used; rope and chain drives are also employed occasionally. Numerous accidents occur in connection with equipment of this kind, which may be divided into two principal groups—the first comprising those due to the breaking of the belts, ropes, and chains, and the second, which is more important, including those in which the hands or clothing of workmen are caught in the moving transmission apparatus.

Belt Depreciation

Wear and deterioration of belts may be caused in various ways. Frictional heat injures leather belts by burning the fibers, and this action is particularly rapid when the belts slip excessively. Belts hanging loose on revolving shafts, and even in operation, may be rapidly worn away by abrasion when the air of the shop contains gritty dust. Temperature, moisture, the tightness or looseness of the belts, and the general condition of the lacings and fastenings, all have an influence upon the life of the belts, and also upon their efficiency in transmitting power. Driving chains wear chiefly by the friction between the links and the sprockets.

In case of deterioration from any of these causes, it is only a question of time when breakage must occur, and then the results are likely to be serious. When a belt breaks the adhesion between it and the driving pulley sometimes holds the belt long enough for it to roll up, after which it is shot off at a speed comparable with the speed of the pulleys over which it runs. At short range a roll of this kind may be as deadly as a cannon ball, and it takes no very active imagination to picture the result, when it is discharged into the midst of a busy shop. A broken belt may also start to roll up, get caught, and then pull down a section of the line shafting. The only method of preventing these accidents is to provide suitable guards for the belts so that even if they break they will not be thrown off. Frequent inspection to remove dirt and grit, and to find weak places, is also of great value. If the belts are seriously worn, the expense of replacing them should not be spared, because the added efficiency and greater freedom from accidents will be ample compensation.

Unprotected Belts

The second general kind of accident caused by transmission apparatus is that in which a workman is caught in a moving belt by his clothes or hands and thrown to the floor or whirled about the shafting. This is one of the most fearful of all industrial accidents, resulting in serious mutilation in almost every case, and we could easily fill pages with the awful details of accidents of this kind. The only way to eliminate such hazards is by carefully guarding all power-transmission equipment where there is the slightest probability of a workman getting caught.

A general point that should be considered in the installation of belt guards is the arrangement of the power-transmission apparatus. This is most important, of course, when a complete installation of new machinery is about to be made; for in cases of this kind it is far easier to safeguard the belting properly, if the shop is laid out with due attention to the needs for the guards. When no preliminary thought is given to the subject of safeguarding, the chances are that no guards will be installed, or else the work will have to be done subsequently at a much greater cost, and will cause more or less temporary or even permanent inconvenience. Moreover, human nature is constituted so that when it is inconvenient to do a certain piece of work, a reason can usually be found for delaying or entirely neglecting it; and when it is the guarding of transmission apparatus that is under consideration, this reason will often be considered to hold good until an accident occurs.

Belt Guard Types

A preliminary study of the problem, at the time the shop is laid out, makes it possible to have the guards installed so that they will not obstruct the aisles or passageways, nor interfere with the working, repair, or inspection of the machines. It may also be decided, in this general plan, whether open methods of guarding by means of rails of pipe or angle iron are to be used in certain locations, or whether it is better to entirely inclose the apparatus. All vertical and inclined belts (and rope drives also) should be completely inclosed to a height of at least 6 feet above the floor, if the guards must be less than 15 inches from the belts. Guards of pipe or angle iron may be used, if they are at least 24 inches high and are placed 15 inches or more from the belt, rope, or pulley that is to be guarded.

Let us assume that a pipe-rail guard is placed about a belt transmitting power from the main shafting on the floor below to a machine on the floor above. If the guard is close to the belt a workman leaning against the guard on the floor above may have some part of his clothing drawn into the narrow slit in the floor by air suction, or by the belt-lacing or clips, and unless the cloth gives way a serious accident may result.

Belt Hazard Important

It is of course logical that the speed and the width of the belts should be taken into account in estimating their hazards. All overhead belts, six inches or more wide, that run at a speed of 1,800 feet or more per minute should be very substantially guarded. The wire-mesh guard framed with angle iron, or the ladder guard turned over at each end so as to include the pulleys, is recommended. In the case of the ladder guard the rungs (if rungs are used) should be close enough together to prevent the belt from falling to the floor in case a break occurs. It is very much better, however, to use lattice work instead of rungs, between the sidebars of the guard. If the upper part of a horizontal belt or rope drive is less than 6 feet above the floor, the belt or rope should be completely inclosed on the sides and top or guarded by a standard railing located at least 15 inches from the belt. Unless the lower part of an overhead belt is 7 feet or more above the floor, the belt should be guarded both on the sides and bottom.—Travelers Standard.

CORED CASTINGS FOR CAPSTAN LATHE WORK

IN all cases where castings have to be turned up, it is essential that the metal shall cut freely according to its class, hard or soft castings having to be made to suit varying duties, but without exception more care has to be given to work dealt with in capstan lathes, as in these the tools have to be changed as seldom as possible. Sand or siliceous matters embedded in the metal give the most trouble, and to prevent annoyances in this direction, the moulds should be faced with plumbago worked up to a fine surface with a soft brush, and cores should be coated with a wash composed of about 80 per cent. finely ground plumbago and 20 per cent. china-clay, if procurable, or some other clay free from sand in other cases. Necessarily, the cores will be in a dried condition when the wash is applied, and will be again dried before placing in the moulds. Plumbago, when properly put on, prevents the adherence of sand, and produces a softer skin to the casting. The use of it adds to the foundry expenses, but against this there is a large decrease in machining costs which more than compensates for the increase in foundry costs.

Brampton, Ont.—The local authorities have requested the Hydro-Electric Commission to purchase three 150 kw. and three 300 kw. transformers.

Series of Practical Questions and Answers for Mechanics

Every care is being taken to include only pertinent practical questions, and give same direct, reliable answers. Catch questions will be avoided. Arithmetic, consisting of simple addition, subtraction, multiplication and division will be found a useful companion study.

Question.—What is the method used when squaring a mixed number, such as 9¾?

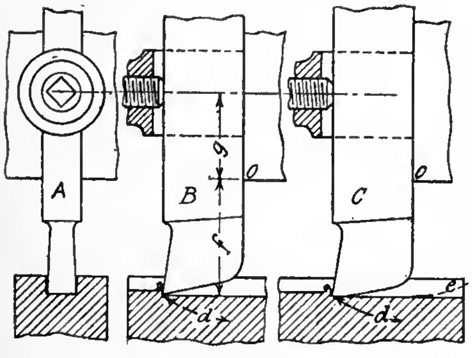
Answer.—The squaring of mixed numbers may be accomplished in several ways. The method generally adopted is to multiply the number by itself, as is done in the case of whole numbers; by the fractional method you first convert the number to an improper fraction. To do this, multiply the whole number of the fraction by the denominator and add on the numerator; the number thus obtained will be the numerator of the desired fraction, and of the same value as the mixed number, thus: $(9\times4)+3=39$, and 39 over 4 will give $\frac{39}{4}$, and $\frac{39}{4}\times\frac{39}{4}$ $=95\ 1/16$. The best method, however, is to convert the mixed number to a decimal, and proceed as in whole numbers, thus: 9¾ equals 9.75, and this multiplied by itself gives 95.0625. Another method may be applied, that of using the formula $(a+b)^2$, which is resolved into $a^2+2ab+b^2$, where (a)= the whole number, and (b)=the fraction, thus $9\times9=81$, $2\times9\times\frac{3}{4}=13\frac{1}{2}$, $\frac{3}{4}\times\frac{3}{4}=9/16$, total 95 1/16.

No set rule can be recommended for the squaring of mixed numbers, as the latter may require to be solved by different methods. The nature of the question, however, will generally indicate the best way of arriving at a solution.

* * *

Question.—What is the best means of preventing chattering when shaping a piece of work with a square-nosed tool?

Answer.—The chattering of the tool when working on a piece of metal may start from many causes, such as the tool being improperly held, too much overhang, slackness in the moveable parts of



the machine, or the tool not ground to suit the work being machined. Under certain conditions it may be very difficult to entirely eliminate the tendency to chatter, but in the majority of cases it is possible to overcome the source of trouble and produce a clean, smooth job. As may be seen in the sketch, the action of the cutting operation tends to move the point of the tool through the arc (d). Now, if this point is such a distance from the fulcrum (O) as to cause excessive leverage—as shown by the proportion of the two lever arms (f) and (g), the possibility of the tool digging in is increased. It is, therefore, always advisable to have the cutting tool extend as short a distance as conditions will permit. In addition to this, the gibs of the various slides should be adjusted so as to remove any lateral motion, but leave the ram free to move in the direction of the cut. However, even after all these apparent causes have been removed the chatter may continue; and, as is often found, the trouble will be traced to the cutting tool itself. As previously mentioned, the point of the tool tends to travel through the arc (d); then if the clearance of the tool is too great, as shown at (B), the tendency to "dig in" is more pronounced. It is good practice to have very little clearance on shaper tools, especially directly back of the cutting edge, as shown at (C). To reduce the possibility of "digging in" to the minimum, the cutting edge of the tool should come directly below the point (O), when the action of the cut will tend to move the tool from the work, as shown at (e).

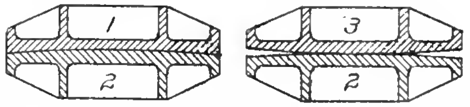
* * *

Question.—When boring out long cylinders, I have sometimes experienced difficulty in overcoming a small ridge which has formed at some point between the two ends. What would cause this, and could you suggest any way to remove the trouble?

Answer.—To find a satisfactory solution to a problem of this description, it would almost be necessary to be on the ground, as there may be many points come up which could not be included in one solution, i.e., the condition of the tools, the method of holding, the length of the cut, the accuracy of the movable parts of the machine, the nature of the work itself, etc.; any one of which, or a combination of several, may prove to be the source of the trouble. It will often be found, where a machine has been working continually on work of a certain length, that the ways of the lathe have become worn, and when a job of an extra length is being handled, there is a tendency of the saddle to rock when it reaches a certain position in its travel. One of the most common causes of trouble of this nature is the stopping of the machine while the cut is in progress. It may often happen that the position of the tool is at some point between the two ends when the shop whistle blows. The workman will naturally shut off his machine for the noon hour, or possibly over-night, and when he returns in the morning he will shove over the lever without a thought as to what may have happened in the meantime. To all appearances everything is as it was the night before; but when the cut has been completed, the calipers or gauges will find a ridge where the tool has started after a period of rest. The cause of this is that the metal will become heated to a certain extent while the tool is cutting, thus expanding the work, and if the machine is stopped and left to stand for a time, especially for a long period, the work will cool off and contract, which allows the tool to dig in to the metal (very little, it is true, but often sufficient to cause trouble, particularly if the work requires to be very accurate). It is always advisable to have the cut go the entire length of the bore without a stop.

* * *

Question.—Why is it necessary to work with three face plates of similar dimensions in order to obtain an accurate surface?



Answer.—While it may not be absolutely necessary to use the three plates to produce a true surface, the best results are obtained by following this method. It is possible to secure a fairly accurate surface by means of a good reliable straight edge, but the plan usually adopted is that of the three plates. To show that error may arise if only two plates are used, we will suppose that the two plates have been planed and scraped to what may appear a perfect contact at every point, and from all visible indications this may be true; but instead of a flat surface, it may be one conforming to the convex and concave surface of a large sphere, as shown in the exaggerated sketch at the left. Now by the use of an additional, or third plate, it is possible to eliminate even the smallest error in this direction. Suppose, for instance, that the two plates (1) and (2) were to show a perfect bear-

ing, and that the plate (3) in contact with the plate (1) should show a similar bearing, it would not prove that all three, or, in fact, any one surface was perfectly flat. By placing plate (3) in contact with plate (2), however, any error—no matter how small—will be immediately indicated. By the use of three surfaces, therefore, the chance of error is almost, if not entirely, removed.

* * *

Question.—What is the capacity, in cubic inches, of the British Imperial gallon; also that of the U. S. gallon?

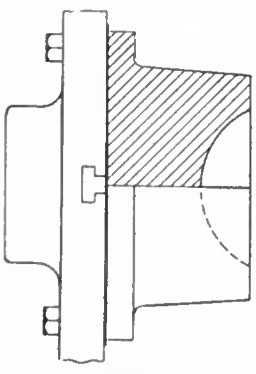
Answer.—The standard unit measure of capacity for the British Imperial gallon, for either liquid or dry material, is that of ten Imperial standard pounds of distilled water having a temperature of 62 degrees, weighed in air of the same temperature, and with the barometer at 30 inches; the water to be weighed with brass weights. While the weight of a cubic foot of water is usually considered to be approximately $62\frac{1}{2}$ pounds, several authorities give the weight as being 62.355 pounds. From this the Imperial gallon will contain $\frac{1728 \times 10}{62.355} = 277.123$ cubic inches. However, the value generally used is that of 277.274, which for all ordinary purposes is sufficiently accurate.

The U. S. gallon weighs 8.345 pounds, and a cubic foot of water at 39.2 degrees F. is 62.425 pounds. The contents of the gallon will, therefore, be $\frac{1728 \times 8.345}{62.425} = 231$ cubic inches.

* * *

Question—When clamping work to the face plate by means of bolts or cap screws, we have often had trouble with the work slipping from its original location; what is a good method to keep the work in a fixed position?

Answer.—Where circumstances will permit, it is sometimes advisable to turn a shallow boss on the base of the casting when facing it off, which will fit into



a corresponding recess in the face-plate of the lathe. In addition to preventing any slip, it offers increased facilities for resetting if the occasion should arise. However, the use of a boss and recess cannot always be resorted to, in which cases the application of a piece of ordinary wrapping paper will often accomplish the desired result. By placing the paper between the face-plate and the work, as shown in the sketch, the adhesive properties are greatly increased, and by giving particular attention to the clamping arrangement, the work will remain quite secure under normal conditions.

* * *

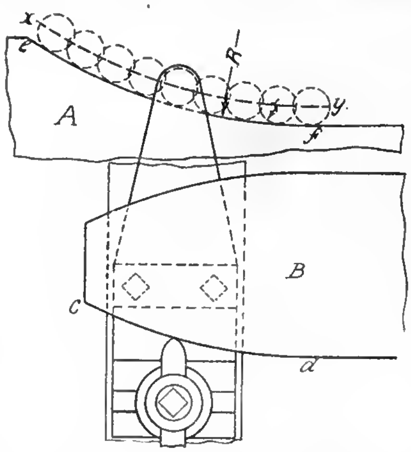
Question.—What should the ballast of an accumulator weigh to maintain a pressure of 350 tons on a 24-inch piston, and what would the pressure be per square inch?

Answer.—To exert a pressure of 350 tons at the press, it is obvious that the source of power—or the weight of the accumulator—must equal that at the press. To calculate the pressure per square inch, the total pressure must be divided by the area of the piston, thus:

$$\frac{350 \times 2000}{24 \times 24 \times .7854} = 1538 \text{ pounds per square inch.}$$

* * *

Question.—In constructing a cam for turning the profile of a shell on an engine lathe, is the shape of the cam the same as that of the nose profile?



Answer.—If the travel of the tool is governed by means of a fixed point in contact with a cam, the shape of the generating surface of the cam will be approximately the same as the shell profile. The general practice, however, is to have a roller acting on a cam, which necessitates the forming of a cam that will cause the true generating point or that of the centre of the roller to travel in a path corresponding to the nose contour. For instance, the profile of the nose on a 6-inch shell is an arc of a circle, having a radius of 11.92 inches; therefore, if the diameter of the cam roller is 1 inch, the shape of the cam surface will require to be an arc of a circle, having a radius equal to that of the shell profile plus the radius of the cam roller. This can be more clearly shown by referring to the sketch, and as the position of the point of the cutting tool is controlled by the position of the cam roller, it is obvious that the cam proper must have a shape generated from the position of the cam roller in the various points along its path of travel.

MOTOR BOATS FOR CHINA

A RECENT number of Shipping and Engineering contains an excellent article upon the growing demand for motor boats to ply upon the inland waters of China. The writer of the article states in part as follows:—The export of marine motors from Great Britain to China has, owing to the war, for the present come to an end, and the trade is now entirely in the hands of American manufacturers. These engines are turned out in 1, 2, 3, 4 and 6-cylinder models, ranging in power from 5 B.h.p. to 110 B.h.p. The motors that have undoubtedly taken the greatest hold on the markets of China, are those which are sold in stationary sets of 3 to 11 h.p., and marine sets from 3 to 50 h.p. A still smaller size is the $2\frac{1}{2}$ h.p. detachable motor which, working with magneto, has found great favor for use with light skiffs and ship's boats.

The larger sets have now been adapted to operate on kerosene, an improvement that adds a great deal to their utility in outports where petrol is difficult to obtain. The paraffin engine is the one that will be most used in China, because of the ease of obtaining fuel in almost any little village at which the boat may happen to stop. Again the simplicity of design of this type makes it a motor that can be operated with safety by the untrained Chinese.

Simplicity of construction and manipulation is one of the principal requirements of a motor intended for the Chinese market. It must be borne in mind by the manufacturer, that his engine is likely to run with the minimum of operative intelligence for long periods without an overhaul, and it might possibly require, in motors intended exclusively for the Chinese market, some small sacrifice of efficiency or lightness, in order to produce an engine that will be proof against the misuse it would probably receive.

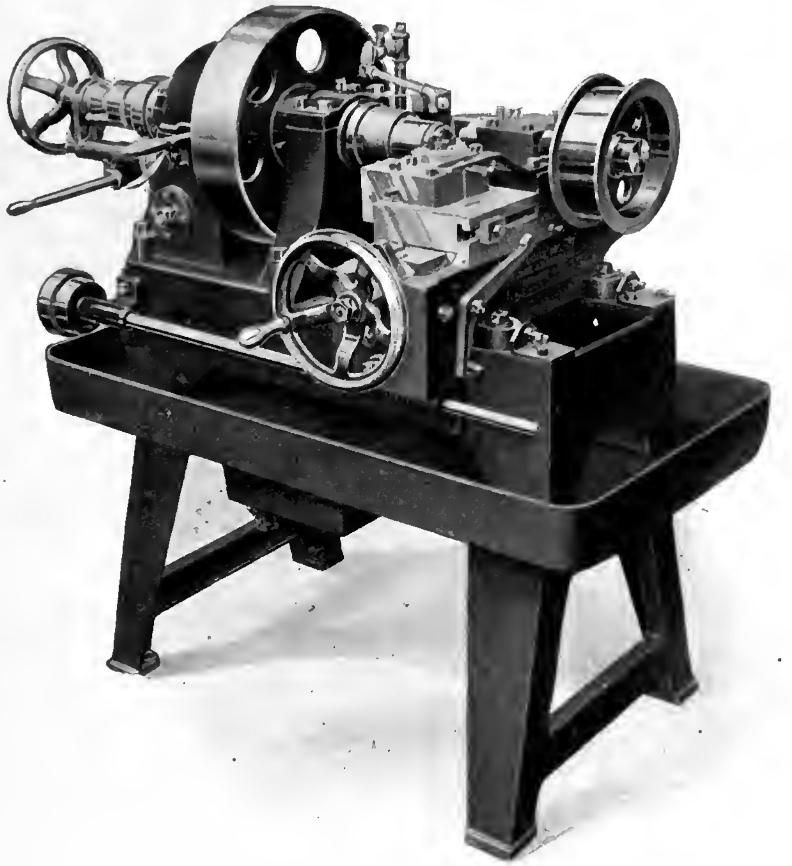
A flux is a substance which, added to ores, metals, or other bodies, combines with the impurities and forms a fusible slag. A flux is added to slag off impurities, to protect the surface of the metal, and to produce a fusible mass. Oxides may be removed from metallic surfaces by using a suitable flux; sometimes an oxidizing flux is used, in order to oxidize impurities, which then combine with the flux to form a slag.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

MILLER FOR STEEL NOSE SOCKETS.

STEEL nose sockets for 18 pdr. shrapnel are now largely used instead of brass sockets. A miller for machining these steel sockets has been developed and put on the market by Edwin J. Banfield, of Toronto. The machine is built in two styles; one for the outside operations and the other for milling the inside thread only. The former will be dealt with first as the outside operations are completed before the inside thread is milled. The accompanying illustration shows the general design of the machine which is of rigid and substantial construction, and weighs 1,200 pounds. A 3 in. shaft is driven by a 16 x 4 in. pulley direct from the line shaft while the milling fixture has an independent drive also direct from the line shaft. A worm gear driven by a pulley at the back revolves the shaft when the thread is being milled; the pump for supplying the cutting compound is also driven from this pulley.



MILLER FOR STEEL NOSE SOCKETS.

The steel sockets when received at the machines have been bored, counterbored, faced inside and outside, and the hole for the powder tube drilled. In the following operations the face of the socket is finished, the undercut and shoulder at the back of the thread are formed, and the outside thread milled. The socket is held on an expanding mandrel which is tightened by means of a taper plug actuated by a hand lever and clutch mechanism. The first operation consists of rough turning the outside diameter, a tool on the cross slide under the work being used for this purpose. The next operation is performed by a series of tools carried in the front tool holder. The first tool faces up the powder tube bars. The second tool finishes face of socket and the radius on the powder tube boss. The third or form tool finishes the shoulder, undercuts for the thread, forms the O.G. on face of socket and turns the diameter to finished size ready for milling the thread.

The final operation consists of milling the thread which is performed by a milling cutter carried in a sliding bearing mounted on the cross slide at the back. The fixture has an independent drive and the feed of the cutter is controlled by a chaser engaging with right hand threads on the outside of the chuck. The socket turns one revolution while the thread is being cut, the shaft being revolved by a worm gear controlled by a clutch. The machine is equipped with a two-speed feed for the carriage, also a rotary pump ensuring a steady flow of cutting compound to the tools, the pump being fitted with a relief valve permitting the compound to be turned off at will. The machine has a capacity of approximately 30 sockets per hour.

The machine for milling the inside threads is practically identical with the one described above with the exception that a collett chuck is used instead of the expanding mandrel and the front tool holder is dispensed with. The socket has now an outside thread which is used for holding it in the chuck while the inside threads are being milled. The socket is first screwed into the threaded collect chuck, the draw-back mechanism being operated by a lever as in the case of the other machine. The miller is driven from a reversing countershaft so that the sockets can be put in the chuck or taken out without stopping the machine. The milling spindle is carried in a sliding bearing mounted on the cross slide. Ample travel is allowed for the cutter so that the operator can handle the work with the freedom and to protect his hand, the cutter is covered by a hinged cap which is thrown back when in operation. The feed of the cutter is controlled by the chaser engaging with right a hand thread on the outside of the chuck. The machine is fitted with a rotary reversing pump equipped with relief valves to ensure a steady flow of compound irrespective of the direction of running. This machine has a capacity of approximately 90 sockets per hour.

MICHELL JOURNAL BEARING

THE Michell principle of thrust absorption has proved so successful as applied to thrust-blocks that there has naturally been a strong inducement to extend its application to ordinary journal bearings. The bearing which is illustrated in Figs. 1 and 4 shows a development of the latter. The bearing represented has been applied to two circulating pumps at the Newport Power Station, Melbourne, Australia. The pumps were made by the G. Weymouth Proprietary, of Melbourne, and are of 220 horse-power, the shaft speed being 490 revolutions per minute.

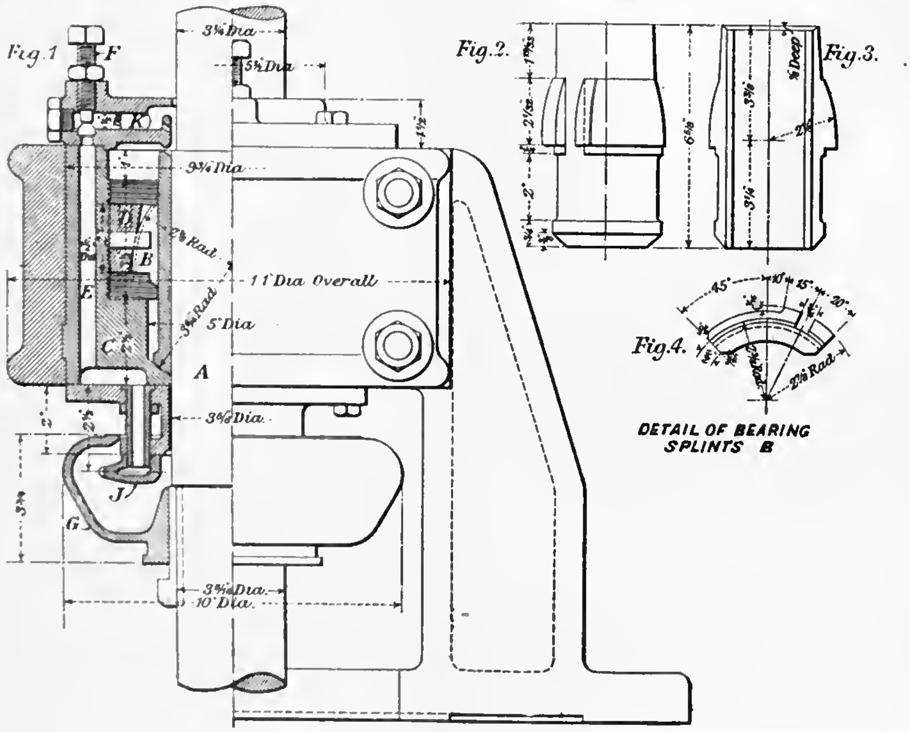
As will be seen from Fig. 1, the shafts are vertical, and, as is well known, sat-

isfactory lubrication is in such case a matter of some difficulty owing to the tendency of the oil to run out at the bottom. In the bearings illustrated, however, this difficulty is completely overcome. There is a definite oil circulation, which is maintained by the rotation of the shaft, and leakage of oil entirely prevented. The journals have, we are informed, been running satisfactorily for some months.

Referring to the illustrations, it will be seen that the shaft A is surrounded by four splints or brasses B, the design of which is shown in detail in Figs. 2 and 4. The ribs or projections shown on the back of these splints are turned to a spherical surface, but, as indicated in Fig. 4, this surface is cut away one-sixteenth clear on the side of the leading edge of the splint, so that when in position the brass can tilt a little to facilitate the entrance of oil between the lubricated surfaces. The lower ends of the splints are also turned to a special surface struck from the same centre as that to which the ribs are turned. The splints rest by these spherical surfaces on the housing C of the bearing. A hollow cone D is screwed down on to the ribs of the splints, holding them in position as indicated. By screwing this cone up or down, the oil clearances between the brass and journal surfaces can be adjusted. It will be seen that by this arrangement the bearing is set up towards the centre of the shaft from four directions, instead of from two, as with ordinary two-part brasses.

The lubricating oil draining from the bearing falls into the cup G, which is keyed to the revolving shaft. Dipping into this cup is a nozzle J, and the oil carried round by the rotation of the cup rushes up this nozzle and through the controlled by screwing up or down the passage E to the top of the bearing, whence it is distributed through the port K. The amount of oil pumped can be set-screw shown at F. A continuous circulation of oil between the rubbing surfaces is thus secured.

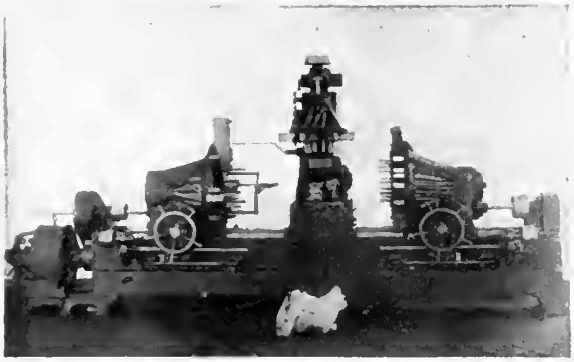
H. T. Newbigin, A.M.I.C.E., 3 St. Nicholas Building, Newcastle-on-Tyne, is the representative of the device in Great Britain



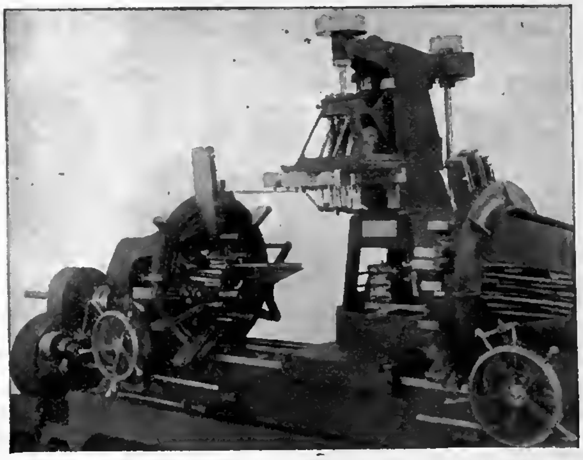
THE MICHEL JOURNAL BEARING.

MULTIPLE SPINDLE DRILLING MACHINE

FOR drilling all the holes in an automobile transmission at once at one setting, the Baush Machine Tool Co., of Springfield, Mass., have perfected the multiple spindle drilling machine shown in the accompanying illustration. This machine is unique in that there are 46 holes in each transmission case and the drilling is done regardless of the fact that some of the holes are on an angle and vary in size from 3/16 to 1-11/16 inch. Each drill runs at the same speed and each group of drills has independent feed.



MULTIPLE SPINDLE DRILLING MACHINE.



MULTIPLE SPINDLE DRILLING MACHINE.

The machine is operated by a 25 horse-power, 230-volt, 1,400 r.p.m., commutating pole, direct current, Westinghouse motor, through a main driving shaft placed at the rear of the machine, connected to the horiznotal heads by steel gears and cloth pinions, and connected to the vertical head by bevel gears. The motor operates equally well in either direction of rotation and can be reversed without changing the position of the brushes.

The bed of the machine is supported on feet, providing ample space for cleaning underneath and preventing the floor from becoming water-soaked if drilling compound is used. All reciprocating parts are enclosed in cast guards, effectually protecting operators from injury. Various spindle speeds are obtained through gear reductions encased in oil-tight boxes on the heads. The spindles are equipped with ball thrust bearings and Baush universal ball joints. An improved type of arm allows a centre distance between holes equal to the diameter of spindle. Spindle may be ad-

justed for different lengths of drills by operating but one screw at the outer end of arm.

The horizontal heads have standard belt-driven feed with automatic control and quick traverse by hand wheel. Vertical head and cluster box slides are automatically controlled by left hand through trip rod and bell crank which operate jaw clutch on reversing gears in gear box. These gears control shaft operating pinion and racks attached to vertical head and slide.

In operation the left hand head is brought forward, automatically engaging feed of vertical head and cluster box slide, which travel the required distance and automatically return to neutral position. The feed for right and left hand head is next engaged by levers. At the same time a spindle on the box jig drills the hole. The feed is automatically tripped by stops, and the heads return to neutral position, completing operation.

HUMPHREY GASOLINE PUMP

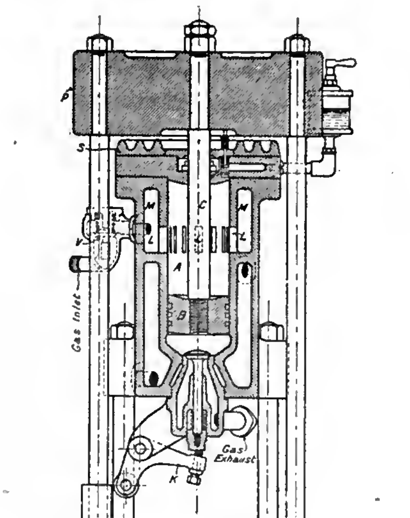
CONSIDERABLE interest was aroused some time ago when an English engineer by the name of Humphrey adapted the principle of the gasoline engine to a direct acting pump, in which the usual iron piston of the engine is replaced by a column of water, on which the pressure of the explosion is exerted. By a suitable arrangement of passages the operation of a four-stroke cycle was maintained, the construction of the apparatus rendering it particularly adapted for dealing with large quantities of water. the Chingford reservoirs of the Metropolitan Water Board, near London, being a conspicuous example of its successful application.

Certain features of the original pump prevented its use in small sizes, but the merits of the principle have induced the Humphrey Pump Co. to bring out a new type in which the gravity effect of the original water column is obtained by the use of a vertical reciprocating mass of metal.

The new type of pump is arranged to work on the two-stroke cycle, using ordinary gasoline, and is similar in appearance to a vertical simplex pump. A part sectional elevation is given showing clearly the explosion cylinder with its valve gear. The pump barrel or water end is bolted to the pump cover, which has projecting feet, on which the weight of the whole structure rests. Three vertical columns or struts extend upward from the pump cover and support the cylinder A, containing the piston B and piston rod C. The latter passes through a suitable packing gland, and carries on its upper end the massive cast iron block P, which is connected by means of two vertical side rods with cross-head Q, to which the pump rod D is fastened. The pump bucket E has a disc valve F on its upper face, and a similar valve G is placed in the bottom of the barrel.

Pump Single-Acting

It will be seen, therefore, that the pump end is single acting, the pumping of the water being done on the up-stroke only. As already mentioned, the cylinder A acts on the two-stroke cycle, and being arranged so that the force of the explosion is exerted upwards, an impulse



PART SECTIONAL ELEVATION OF GASOLINE PUMP

is accordingly given to the pump bucket on every upward stroke.

Surrounding cylinder A is a water jacket, and above this again is an annular space M connected with the cylinder space by ports L. Assuming that a charge has been fired with the parts in position as shown, the piston travels upward, passing the ports L and enclosing a small volume of mixture which cushions the piston as it comes to the end of its stroke. Before the lower edge of the piston reaches ports L, the exhaust valve in the lower end of the cylinder is opened by bell crank K actuated by cam R. This relieves the pressure of the exhaust gases so that the mixture in space M, which is under slight compression, may force all of the exhaust gases out through the valve when the piston uncovers the ports on its upward travel.

The weight of the moving parts now causes them to descend, the exhaust valve closing at the same point as it opened, so that the fresh charge is compressed to a pressure of about 200 lbs. per sq. in., thus acting as a cushion to stop the moving parts. At the lower limit of travel, ignition of the charge is effected by a contact maker U, by altering the position of which it is possible to shorten the stroke, the absence of any revolving parts removing the possibility of danger due to pre-ignition where there is a dead centre. A rubber buffer S on the top of the cylinder prevents damage should leaky valves or other causes allow the weight to descend too far. In the larger pumps of this type the cylinder head telescopes into the weight and cushions on the enclosed air.

The starting of the pump is done by a barring lever acting underneath the cross-head, which forces the parts up till the mixture in space M has access to the cylinder. When the lever is released the moving parts fall and commence their functions, as already described.

These pumps can be operated on artificial gas, producer gas, or gasoline, and are being adapted to paraffin and heavy oils. The 3-in. pump shown can deliver 9,200 gals. per hour against a head of 8 ft., and with suitable water end will operate against a head of 172 ft., delivering 575 gals. per hour. The gasoline consumption is five-eighths of a pint per hour, and the weight 350 lbs.

IT is estimated on fairly reliable although not official information that in England 27,000 men are engaged in building heavier-than-air flying machines. In addition, there are men engaged in building auxiliary equipment such as magnetos and carbureters. It is no exaggeration to say that in Great Britain alone about 40,000 men are now engaged in aeroplane work. It is stated in Germany by well informed people that the English factories have an output of 140 machines a week. The French factories are doing their part; several plants in the United States and Canada are doing theirs. In Germany four big factories have been turned over to aeroplane building, among them one of the largest plants of the Allgemeine Elektrizitats Gesellschaft.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - - Vice-President
H. V. TYRRELL - - - - - - General Manager
PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.
PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.
Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS,

Office of Publication, 143-153 University Avenue, Toronto, Ont.

Vol. XV. JUNE 29, 1916 No. 26

EXPORT TRADE DEPENDENT ON A MERCHANT MARINE

TO effectively develop and maintain any worth-while export business, something more than the ability to secure orders and possession of the necessary manufacturing capacity are required. It is for the most part overlooked that prompt and dependable transportation facilities should be available, also that their control be in the nature of a domestic, and not foreign, vested interest. Concurrently with the preparations to distribute our products of the field, the mine and factory over the markets of the world, strenuous effort should be made towards the creation and upbuilding of a powerful merchant marine, the individual constituent of which would be of Canadian manufacture and Canadian manned.

While it is probably true that even if we had possessed a fair sized fleet of Canadian-owned sea-going ships, many of them would in the past month have been commandeered and few, if any, would even now have been available for our export requirements, yet we do not get away from the fact that we have been dependent for ocean transport on foreign built and foreign owned vessels. Again, unless some real action is now taken we will be just so much more at the mercy of foreign shipowners as will make well-nigh impossible an export trade worth the name.

It is not realized that Canada's possession of a merchant marine of the greatest possible proportions will furnish the basic stimulus to her industrial development in both domestic and foreign markets, and that while its revenues will be altogether Dominion-accruing, its services and activities need not be Dominion-dependent, but of world-wide scope.

Canadian built, manned and owned ocean-going vessels as the result of Canadian enterprise are the medium through which our farmers, our merchants and our manufacturers can most surely and effectively lay hold of the trade requirements of other countries and in view of the trade war which is generally anticipated when the thirst for blood has been sated, there is little doubt that those countries with the more ample ocean transport will reap the more ample benefit.

We have neither controlled shipbuilding plants nor are any measures in force or likely to be so, prohibiting their further establishment. We are, however, lacking first of all in vision, and as a natural result, enterprise is also lacking. It may not, however, be inferred that everybody is asleep, so to speak. Here and there bright and keen minds are alert and active, and if we judge rightly their numbers are increasing and their influence is becoming more powerful and wider in scope.

In spite of the fact that recruiting has in some measure restricted the output of coal from the mines in the Maritime Provinces, the reduced quantity cannot be shipped for want of "bottoms." As a result, the City of Montreal with its myriad factories is dependent to a large extent for its fuel supply from American centres, via, lake and canal waterways. Such a condition ought not to exist one day longer than necessary, and its remedy like that of the preparation for prosecuting Canadian export trade on sane and business-like lines lies in our creation and developmet of an ocean port and waterway shipbuilding industry. The more intensely the latter is propagated and the more firmly established it in time becomes, the more sturdy will also be the growth of a seafaring community.

The creation and establishment of even a moderate-sized shipbuilding plant involves considerable capital investment, outstripping in this respect most specialized industries. The scope of its product is correspondingly wider, and as a developer of other industries and crafts it is without a peer. Cost of production—labor cost comparatively, has always been urged as a good and sufficient, and possibly the only reason, why shipbuilding should not be encouraged on our shores. Government after government have taken up this attitude, and strange to relate, when comparative costs may be said now to synchronize, and merchant shipbuilding in the world's premier centre has for obvious reasons and during many months, been reduced to an absolute yet undesirable minimum, the present administration still busies itself casting about for excuses to bolster up an untenable position, instead of bringing to the subject the measure of intelligence and consideration it deserves, and taking a hand in formulating a basis of national support.

WOMEN MUNITION WORKERS

THE recent action of representative Canadian manufacturing concerns in arranging to employ a considerable number of women on shell work serves to emphasize a feature of the labor situation which so far has not affected our manufacturing interests acutely enough to make the results apparent to the general public.

While the entrance of women into the ranks of munition workers in Britain was accepted as a matter of course, being only one of many necessary developments under the present circumstances, a considerable variety of opinion existed regarding their suitability for much of the work of producing munitions, but published accounts show that their ability has not only enabled many of them to surpass male operators in performance, but has led to their employment on general machine construction and tool room work with a degree of success which is surprising.

Where the introduction of women workers in a machine shop is an entire innovation, the matter has to be handled carefully to insure the full amount of success. A significant feature of the situation is indicated by an English correspondent of a contemporary. Regarding a prominent machine builder he says: "No young girls are employed. The women engaged are those who enter the factory with a serious purpose and have homes to keep. Several widows of men who were previously employed in the same shops and have been killed in the European War are included." Shell making in Canada is a tense occupation, and if events demand the more general employment of women, employers will only be doing their duty to the themselves, their community and their country by so selecting and paying their help, that the greatest good will be done to the greatest number while they themselves may in some cases derive the greatest benefit of all.

INDUSTRIAL NOTABILITIES

WILLIAM DONALD ROSS, Vice-President, Nova Scotia Steel & Coal Co.; director, Bank of Nova Scotia; director, Porto Rico Railways Co., was born at Little Bras d'Or, N.S., on June 20, 1869, the son of John Ross and Isabella Mackay.

He was educated in the Public and High Schools of New Glasgow, N.S., and entered on his business career by joining the staff of the Bank of Nova Scotia in 1883. His connection with that institution was unbroken until 1901, he having in the interval filled successively the positions of manager at Stellarton, N.S.; assistant inspector at head office; manager, New Glasgow; and manager at Charlottetown, Prince Edward Island.

WILLIAM DONALD ROSS.

During the years 1901-1902, Mr. Ross was chief clerk in the Finance Department at Ottawa. In the latter year he became assistant general manager of the Metropolitan Bank at Toronto, being appointed general manager in 1903, and serving in that capacity until 1914.

He successfully conducted the negotiations towards a merger of the Metropolitan Bank with that of the Bank of Nova Scotia. He is a councillor of the Canadian Bankers' Association, and in matters financial generally, his advice and co-operation are largely in request.

As a director and later as vice-president of the Nova Scotia Steel & Coal Co., the scope of Mr. Ross' activities have been very materially enlarged, and more especially so when account is taken of the extent to which that concern has thrown itself into the successful manufacture of munitions, rolling stock and steel products generally as a result of the war.

His clubs are the Toronto, Ontario, York, Toronto Hunt, and the St. James, Montreal. In religion he is Presbyterian. His home is at 112 St. George Street, Toronto, Ont.

—Photo, Courtesy International Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh		$18 70
Lake Superior, charcoal, Chicago		19 75
Michigan Charcoal iron		28 00
Ferro nickel pig iron (Soo)		25 00
	Montreal	Toronto
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Hamilton, No. 1	$26 00	$24 00
Hamilton, No. 2	26 00	24 00
Victoria, No. 1	27 00	25 00
Victoria, No. 2X	26 00	24 00
Victoria, No. 2 plain	26 00	24 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base, Toronto	3.25
Steel bars, base, Toronto	3.25
Steel bars, 2 in. and larger, base	5.25
Iron bars, base, Montreal	3.00
Steel bars, base, Montreal	3.25
Twisted reinforcing bars, base	3.30
Bessemer rails, heavy, at mill	2.50
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	...
F.O.B., Toronto Warehouse.	**Cents**
Steel bars, base	3.25
Small shapes	3.75
F.O.B. Chicago Warehouse	**Cents**
Steel bars	3.10
Bars, 2 in. and up	4.00
Structural shapes	3.10
Plates	3.50

FREIGHT RATES

Pittsburgh to Following Points

Per 100 lbs.

	C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper, carload	$31 00	$30 50
Electrolytic copper	31 00	30 50
Castings, copper	30 50	30 00
Tin	47 00	47 00
Spelter	16 00	16 50
Lead	9 00	9 00
Antimony	30 00	30 00
Aluminum	66 00	66 00

Prices per 100 lbs.

BOILER PLATES

	Montreal	Toronto
Plates, 1/4 to 1/2	$4.25	$4 25
Heads	4 50	4 50
Tank plates, 3-16 in.	4 75	4 75

WROUGHT IRON PIPE

Prices in effect April 26, 1916

Buttweld

Per 100 feet	Black	Galv.
1/8 in.	$ 3 00	$ 4 50
1/4 in. and 3/8 in.	3 06	5 31
1/2 in.	3 91	6 08
3/4 in.	4 72	7 65
1 in.	6 97	11 31
1 1/4 in.	9 43	15 30
1 1/2 in.	11 28	18 29
2 in.	15 17	24 61
2 1/2 in.	23 99	38 90
3 in.	31 37	50 87
3 1/2 in.	37 72	61 18
4 in.	44 69	72 49
Lapweld		
2 in.	$17 02	$26 46
2 1/2 in.	25 16	40 07
3 in.	32 90	52 40
3 1/2 in.	39 56	63 02
4 in.	46 87	74 67
4 1/2 in.	57 15	90 81
5 in.	66 60	105 82
6 in.	86 40	137 28
7 in.	116 62	179 70
8 in. x 25 lbs. per ft.	122 50	188 75
8 in. x 25 lbs. per ft.	141 12	217 44
9 in.	169 05	260 48
10 in. x 32 lbs. per ft.	156 80	241 60
10 in. x 40 lbs. per ft.	201 88	311 06

List for Ontario, Quebec and Maritime Provinces

OLD MATERIAL

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$16 00	$16 50
Copper, crucible	19 25	19 50
Copper, heavy	19 50	19 75
Copper wire	19 75	20 00
No. 1 machine compos'n	15 00	15 00
No. 1 compos'n turnings	13 00	13 00
New brass clippings	14 50	14 50
No. 1 brass turnings	11 50	11 50
Heavy melting steel	9 00	9 50
Boiler plate	11 75	10 50
Axles, steel	13.00	15.00
Axles, wrought iron	18 75	19 00
Tires, steel	11.75	11.00
Rails	13 50	13 50
Shafting	16 50	16 00
Malleable scrap	10.00	12.00
Pipe, wrought iron	11 00	10 00
Stove plate	11 00	10 50
No. 1 machin'y cast iron	14 75	14 50
Heavy lead	5 50	5 50
Tea lead	5 50	5 50
Scrap zinc	11 00	11 00
Aluminum	37 00	36 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Coach and lag screws	50
Stove bolts	62 1/2
Plate washers	25
Machine bolts, 3/8 and less	40
Machine bolts, 7-16 and over	30
Blank bolts	30
Bolt ends	30
Machine screws, flat head, iron	66 & 5
Machine screws, fl & rd. hd, brass	12 1/2
Machine screws, fil head, iron	25
Machine screws, fil. head, brass	5
Nuts, hex., up to 1 in.	$3.75 per lb. off
Nuts hex., over 1 in.	$2.00 per lb. off
Copper rivets and burrs, list plus	30
Burrs only, list plus	50
Iron rivets	37 1/2
Boiler rivets, base 3/4-in. and larger	$4.85
Structural rivets, as above	4.75
Wood screws, flathead, bright	80
Wood screws, flathead, brass	47 1/2
Wood screws, flathead, bronze	40

MILLED PRODUCTS

	Per Cent.
Sq. & Hex Head Cap Screws	50
Sq. Head Set Screws	55
Rd. & Fil. Head Cap Screws	25
Flat & But. Head Cap Screws	net
Finished Nuts up to 1 in.	50
Finished Nuts over 1 in.	37 1/2
Semi-Fin. Nuts up to 1 in.	50
Semi-Fin. Nuts over 1 in.	37 1/2
Studs	45
Taper pins	.65
Coupling bolts	net
Planer head bolts, without fillet	.15
Planer head bolts, with fillet	net
Planer head bolt nuts up to 1 in.	.60
Planer head bolt nuts, over 1 in.	.55
Planer bolt washers	list plus 10
Hollow set screws	list plus .20
Collar screws	list plus .20
Thumb screws	.20
Thumb nuts	.75

BILLETS

	Per gross ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	42 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	60 00

NAILS AND SPIKES

Standard steel wire nails, base	$3 75	$3 70
Cut nails	3 40	3 40
Miscellaneous wire nails		65%
Pressed spikes, 5/8 diam., 100 lbs.		$3 90

MISCELLANEOUS

Solder, guaranteed	0.29½
Solder, strictly	0.27½
Babbitt metals	.11 to .60
Soldering coppers, per lb.	.53
Putty, 100-lb. drums	3.00
White lead, pure, per cwt.	13.95
Red dry lead, 100-lb. kegs, per cwt.	13.87
Glue, French medals, per lb.	0.20
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls., gal.	0.63
Linseed oil, raw, single bbls.	0.70
Linseed oil, boiled single bbls.,	0.73
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.00
Packing, square headed	0.25
Packing, No. 1 Italian	0.30
Packing, No. 2, Italian	0.23
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS

	Per Cent.
Standard drills to 1½ in.	45
Standard drills over 1½ in.	5
3-fluted drills to 1½ in.	15
3-fluted drills over 1½ in.	net
Bit stock	55
Ratchet drills	net
Machine bits for wood	15
S.S. drills for wood	45
Wood boring brace drills	25
Electricians	20
Sockets	30
Sleeves	50
Taper pin and taper reamers	25
"Premier" and "Leader" chucks	10
Arbors for above	net
Drills and countersinks ....list plus	5
Bridge reamers	55
Centre reamers	net
Chucking reamers	net
Hand reamers	5

High-speed drills up to 1½ in. and over 1½ in. Double list plus 20 per cent.

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60 per cent.; headers, 60; flanged unions, 55; malleable bushings, 60; nipples, 72½; malleable, lipped unions, 60.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$4 15	$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 50
Canada Plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized	7 00	7 00
Queen's Head, 28 B.W.G.	7 75	7 75
Fleur-de-Lis, 28 B.W.G.	7 35	7 35
Gorbal's Best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	7 00	7 00
Premier, 10¾ oz.	7 30	7 30

PROOF COIL CHAIN

¼ in.	$9.45
5-16 in.	9.10
⅜ in.	8.35
7-16 in.	7.15
½ in.	6.95
9-16 in.	6.95
⅝ in.	6.80
¾ in.	6.70
⅞ in.	6.55
1 inch	6.40

Above quotations are per 100 lbs.

ELECTRIC WELD COIL CHAIN B B

⅛ in.	$15.50
3-16 in.	11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16 in.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Great Western, American	65-10
Kearney & Foot, Arcade	65-10
J. Barton Smith, Eagle	65-10
McClelland, Globe	65-10
Black Diamond	65
Delta Files	60-10
Nicholson	65-10
Globe	65-10
Vulcan	70-10
Disston	65-10

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$19 55	.....
1¼ in.	19 55	.....
1½ in.	19 55	14 00
1¾ in.	25 00	15 00
2 in.	25 00	15 50
2¼ in.	28 50	18 50
2½ in.	32 00	21 00
3 in.	40 00	24 00
3½ in.	45 00	28 00
4 in.	50 00	34 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	.45
Royalite, per gal.	.13½
Machine oil, per gal.	.26½
Black oil, per gal.	.14½
Cylinder oil, Capital	.47½
Cylinder oil, Acme	.38½
Standard Cutting compound, per lb.	0.6
Lard oil, per gal.	1.35
Thread cutting oil	.35
Imperial quenching oil	.38½
Petroleum fuel oil	.12

WIRE ROPE

1st Grade, 6 Strands

	Per 100 lbs.
Galvanized, 24 wires, ⅜ in.	$ 8.35
Galvanized, 24 wires, 1 in.	24.05
Black, 19 wires, ⅜ in.	6.90
Black, 19 wires, 1 in.	21.30

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	40%
Standard	40 & 10%
Cut leather lacing, No. 1	$1.30
Leather in sides	1.10

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun. Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun. Steel Tape, 50 ft.	3.50

COKE AND COAL

Solvay Foundry Coke on application.	
Connelsville Foundry Coke	$7.02
Yough Steam Lump Coal	.....
Pittsburgh Steam Lump Coal	4.30
Best Slack	3.87

Net ton f.o.b. Toronto

WASTE

WHITE	Cents per lb.
XXX Extra	.16
Peerless	.16
Grand	.15
Superior	.15
X L C R	.14
Atlas	.14
X Empire	.13
Ideal	.13
X press	.12
COLORED	
Lion	.10¼
Standard	.9¼
No. 1	.9¼
Popular	.8¼
Keen	.7¼

WOOL PACKING

Arrow	
Axle	Prices on
Anvil	application
Anchor	

WASHED WIPERS

Select White	
Mixed colored	Prices on
Dark Colored	application

This list subject to trade discount for quantity

ANODES

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.37 to .39
Tin	.58 to .60
Zinc	.26 to .28

Prices Per Lb.

COPPER SHEETS

	Montreal	Toronto
Bars, ½ to 2 in.	$47 50	$47 50
Plain sheets, 14 oz., 14 x 28 in., 14 x 60 in.	46 00	46 00
Copper sheet, tinned, 14 x 60, 14 oz.	55 00	55 00
Copper sheet, planished, 14 x 60 base	58 00	58 00
Braziers' in sheets, 6 x 4 base	47 50	47 50

BRASS

Brass rods, base ½ in. to 1 in. rd.	0.55
Brass sheets, 8 in. wide, 20 oz.	0.60
Brass tubing, seamless	0.55
Copper tubing, seamless	0.55

PLATING SUPPLIES

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck.	.90
Emery in kegs, American	.04 to .05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

RUBBER BELTING

Standard	50%
Best grades	30%

LEAD SHEETS

	Montreal	Toronto
Sheets, 3½ lbs. sq. ft.	$12 50	$13 00
Sheets, 3½ lbs. sq. ft.	12 50	13 00
Sheets, 4 to 6 lbs. sq. ft.	12 25	12 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy	.35
Copper, sulphate	.15-24
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.42
Sodium hydrate	.04
Sodium hyposulphite per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., June 26, 1916.—The general industrial situation continues active. The majority of plants, however, especially those working on munitions, are busy, and many factories are being extended to accommodate additional equipment. One of the serious features is the scarcity of labor, which tends to curtail the output, and, as the summer advances, this is expected to become more pronounced. General opinion seems to be that the apex of the market in prices of raw and semi-finished materials has been reached, but it is not expected that any appreciable decline will be shown for some time.

Pig Iron

The situation in pig iron is unchanged, with a heavy demand for steel purposes the chief feature. Inquiries for foundry pig are better; this may be accounted for by the prospect of an easier market. Philadelphia prices on No. 2 foundry show a decline of 25c a ton, and low phosphorus pig has declined $1 a ton.

Steel

Domestic demands have fallen off a little, but export requirements more than make up for any loss in this direction. Increased demand for open-hearth steel has somewhat steadied the market and quotations are becoming firmer. Lower prices on spelter have affected the market in sheets, and some lines have been reduced. Queen's Head is now $7.50; Fleur-de-Lis, $7.25; Premier No. 28, $6.75, and Premier, 10¾ oz., $7.10. Iron bars are fairly active, and the Chicago price shows an advance of $2 a ton. Railroad spikes, Chicago, are higher, latest quotations being $2.75, or an advance of $2.50 a ton. Pittsburg quotations on cold-rolled shafting have declined, the discount being 20 to 15 per cent., against 15 to 10 a week ago. Demand for wrought iron pipe and boiler tubes is not heavy, but prices are very firm.

Metals

The general tone of the metal market is inclined to weakness. With the exception of aluminum, very little activity is shown, and continued declines have met with little response from buyers. Copper is being offered at easier prices. The foreign situation has weakened the tin market here. Lead is steadier, but spelter is attracting little notice.

Copper.—The present condition of the market is very quiet, and little activity is shown in regular business. Owing to the Mexican situation it is anticipated that some copper mines may be affected by existing conditions unless provision is made to protect the mines in the disturbed locality. It is expected that the market will retain its present level, or possibly a little lower, until further buying on a large scale develops. London reports additional weakness, the decline for the week being £15 on standard spot; £14 on futures, and £10 on electro spot. Selling of metal is on the increase, and producers are offering easier terms on next quarter metal. Latest quotations are £98 for standard spot; £96 for futures, and £130 for spot electro. Light inquiry and resale of consumers' copper has resulted in the New York prices declining; lake and electrolytic showing a decline of ⅝c, are now quoted at 26⅞c, and castings at 24¼ show a decline of 1c per pound. The market here continues quiet, and dealers report a decline of 1c on all coppers, quoting 31c for lake and electrolytic, and 30c for castings.

Tin.—Dullness prevails, and the trade continues very quiet, and unless early buying develops, it is expected that further declines will be quoted. London quotations continue to weaken, and lack of interest and slight buying have been followed by further weakness on the New York market: the nominal price of 40¼c being a decline on the week of 1½c per pound. Local dealers report a quiet market on declining prices; present quotations of 47c show a decline of 1c.

Spelter.—The present market is dull and weak. Very little metal is being purchased by galvanizers, but their requirements will likely develop into buying as soon the market assumes a more steady tone. London and New York markets continue dull and inactive, the

nominal price of 12.175c being 1c lower than a week ago. The local situation is unchanged, with prices easier. Dealers are asking 16c, being a decline of 1c per pound.

Lead.—The situation in lead is practically unchanged. Export inquiry is better, but so far purchases are light. The outside interests have advanced their price from 6.8c to 6.9c per lb. Local conditions are unchanged, and dealers here are quoting 9c per lb.

Antimony.—The market continues dull, and additional declines do not appear to interest buyers. New York prices have declined 1½c, and dealers here are quoting 30c, which is a decline on the week of 1c per pound.

Aluminum.—Foreign inquiry and buying is adding strength to aluminum; prices have remained firm; New York is quoting 63c to 65c, and dealers here are asking 66c per pound.

Machine Tools and Supplies

Owing to recent additional orders being placed for large shells, the demand for equipment has slightly increased: but the delivery on standard equipment is almost normal.

Scrap

Dealers report a fair business, but a weak market, quoting 1c less on copper, ranging from 16c for light to 19½c for heavy, and 19¾c for wire. No. 1 compositions have declined ¾ of a cent, and are now quoted at 13c. Rails, shafting and wrought iron pipe show a decline of ½c, quotations being 13½c, 16½c and 11c respectively. Old stove plate is a little stronger, an advance of ½c making the present price 11c per pound. Scrap zinc is quoted at 11c, being a decline of ½c per pound.

Toronto, Ont,. June 27.—The steady improvement in trade throughout the country is being well maintained and the outlook continues favorable. Railway earnings this month are showing a marked increase over the corresponding period of last year which is a good indication of the general trend of business. The financial situation has also improved considerably, particularly because of war orders which have resulted in a large amount of money being distributed in the country. The greatest activity still prevails in munition plants, and machine tool manufacturers both large and small are very busy on this account. The steel trade is quieter as is usual at this season. The steel market continues firm although indications point to prices having about reached the top. No marked recession however, is anticipated for some time to come. The weakness in the ingot metal markets continues and further declines have to be noted this week.

Steel

The usual summer dullness prevails in the iron and steel market. The new demand is lighter and the upward movement seems to have come to a definite stop. Although the mills are sold up for the remainder of the year and on some lines have booked considerable business for delivery towards the end of the first quarter of 1917, consumers are hesitating in placing new contracts as they are looking for a possible decline in prices. The market is easier as a result of the big increase in the capacity of the mills, this circumstance having a tendency to lower prices. No marked recession however is anticipated for some time to come as no material falling off in either export or domestic demand is expected for many months. Even after the war, it is very probable that there will be a brisk demand for steel products from all sources. There are no price changes of importance to note this week except that iron bars have moved up to the level of steel bars at $3.25 per 100 lbs. The new demand for boiler tubes is not so urgent, as nearly all consumers are covered for some time ahead. The wrought iron pipe market is quieter as the amount of new business has fallen off. Prices of skelp, however, are very strong, the mills being sold up for three or four months ahead. Shafting is firm and still high in price, most consumers being covered over the remainder of the year and makers are largely sold up for that period.

The sheet market is quieter but abnormal conditions preclude any weakness developing owing to the shortage and increasing price of sheet bars. The demand for black sheets is lighter but this is offset by decreased production and with the differential between costs and selling prices steadily disappearing no weakness in price has developed, Blue annealed sheets are in good demand. The decline in spelter has not as yet affected the price of galvanized sheets in the local market although quotations are lower in the States. Galvanized sheets are however moving more freely although the output is still far below normal. The recent declines in the price of spelter have developed irregularity and uncertainty in the market for galvanized sheets which may lead to lower prices.

The steel market is easier in the States but the quietness is not affecting prices. The new demand is lighter but export business continues very heavy, particularly for steel bars and railway material. Considerable strength is given to the situation owing to the mills being sold up for practically everything during the remainder of the year. Steel bars are unchanged at 2.75c, plates 3.75c, and shapes 2.50c, Pittsburgh. Bessemer billets have declined $2, and are now quoted at $42 while open-hearth billets and sheet bars have recovered and are now back at $42 per ton Pittsburgh.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Scrap

The scrap market continues quiet and quotations have a weaker tendency. Scrap copper, machine composition, and brass have declined but aluminum is higher. Heavy melting steel is firm but unchanged. The demand for metals for munitions continues heavy but ordinary business is dull.

Machine Tools

The situation in the machine tool market is much the same as last week. Some nice orders for equipment for machining large shells have been placed recently while others are pending. Large swing lathes are in good demand and a number of enquiries have been received by local dealers for heavy duty drills, grinders and cutting-off machines. Standard equipment is in fair demand, the orders being principally for single tools. Deliveries are much quicker especially on the large lathes.

Supplies

Business continues good, the activity in the munitions plants being reflected in the demand for machine shop supplies. Prices generally are firm and steady, advances now being fewer and less frequent. An advance on some of the Butterfield Co. products are now in effect. The following are a few of the new discounts: Reece screw plates, 15 per cent.; dies 10 per cent.; taps up to 1 in 50 per cent.; and over 1 in., 35 per cent.; collets, stocks and caps 10 per cent.; Derby stocks and dies 20 per cent.; stock and dies 10 per cent.; stocks and collets 10 per cent.; hand taps 1-16 in., to 15-64 in., 60 per cent.; ¼ in., to 1 in., 50 per cent.; and 1 1-16 in., to 2 in., 35 per cent. Linseed oil has again declined and is now quoted at 70c and 73c for raw and boiled respectively. Gasoline is unchanged and it is believed that prices will not go any higher. A decline in white lead is considered probable in the near future.

Metals

The metal markets continue weak with quotations still declining. Although the demand for metals for munitions is still very heavy, production has increased and has caught up with the consumption which naturally tends to weaken the position of the metals involved. Copper and aluminum have shown less tendency to weakness than other metals, and will probably remain around the present levels. Developments in the Mexican situation will probably affect copper and tend to strengthen the market, although there is no evidence of this as yet. Tin is weak following a decline in London, and the market continues easy. Spelter has also declined and the market is weak with consumers awaiting developments. Lead has still a weak tendency but quotations are unchanged. The demand for antimony is dull and the market unsustained with quotations lower. Aluminum is strong and higher due to improved demand and scarcity of supplies. Solders have declined due to weakness in the tin market.

Copper. — The market is being depressed by second hands who continue to make concessions and it appears likely that the market will remain in the present condition until a new buying movement develops. The Mexican situation is being considered, but so far the market has not been affected to any noticeable degree. A war between Mexico and United States would mean cutting off supplies of copper from the former country which would no doubt result in a reaction in the market and higher prices. Copper is a shade weaker locally and quotations are entirely nominal at 30½c per pound.

Tin.—The market continues weak following a decline in London. Buyers are showing little or no interest in the metal and appear to be awaiting developments. The local market is quiet and lower at 47c per pound.

Spelter. — The market is dull and weak following a decline in London. The market continues in the hands of second sellers who are willing to sell at concessions. Most of the producers however, are not making any effort to secure business at prevailing levels. Locally quotations are lower at 16½c per pound.

Lead.—The market is a little firmer at unchanged quotations in New York but weaker in London. Business is more active and indications point to a considerable amount of lead being sold in the near future. The Trust price of 7c New York is well held, with the outside market showing a slight advance to 6.95c New York. Lead is unchanged locally at 9c per pound.

Antimony.—The market is dull and weak with light demand. Although it is reported that small consumers have been buying; the larger consumers show no interest in the market at present. Local quotations are lower and nominal at 30c per pound.

Aluminum.—The market is firm and active due to increased demand and scarcity of metal. Quotations are higher at 66c per pound.

Solders.—Prices have again declined following the weakness in the tin market. Guaranteed is now quoted at 29½c and strictly at 27½c per pound.

RUSSIAN MARKET FOR ELECTRICAL SPECIALTIES

THAT Russia will be one of the most important markets for electrical goods after the war is generally recognized, and if advantage is going to be taken of the hostility to German wares which will prevail for a long period after the war, even if no prohibitive tariff is put in force, should be at once taken to ascertain the particular requirements of this great market. Information relative to the above appears in all the official reports dealing with trade prospects in the territory of our Ally.

The last official to lay stress on the importance of doing something at once is the British Consul at Batoum. He points out that before the war the electrical goods required in the Caucasus were mainly of German origin. There is said to be such a great demand from this district that American and other manufacturers are already giving close attention to the local requirements, but that if the opportunity is not allowed to slip there is no reason why Canadian sources of supply should not also be tapped.

Stress is laid on one or two special points; the need for a close study by British houses of the question of price and terms of payment; also on the importance of being represented by travellers who speak Russian, and who carry Russian price lists with the prices worked out in roubles at the current rate of exchange. These are hints which apply not merely to the Caucasus, but to the whole of the Russian market, and it is hoped they will be taken to heart.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian. — Col. N. Golejewski, Military Attachè, Room 904 Flat Iron Building, New York City.

DOMINION STEEL CORPORATION

THE future policy of the Dominion Steel Corporation was outlined by President Mark Workman at the annual meeting of shareholders held in Montreal on June 20. After reviewing the year's operations, Mr. Workman stated that, following a personal investigation, he was of opinion that the company's coal department was equal to any on the continent, but that in order to successfully compete in the world's steel markets, after the close of the war, improvements at the steel plants were necessary.

Remodel Blast Furnaces

Mr. Workman advocated such improvements being made from earnings. In fact, he announced that the first step in the new policy of reducing costs and securing the utmost efficiency from the steel plants had already been taken. This consisted of the remodelling of two of the oldest blast furnaces on the most approved modern lines. As the furnaces had reached the stage where reconstruction was necessary in any event, the work to be carried out would not entail a serious extra expenditure. It was his desire to carry out the same policy throughout the entire steel plant. At the present time more of this work could be started, were it not for the scarcity of labor and the high cost of raw materials. The labor situation at the plants was satisfactory, but all of the company's employees were actively engaged in production, and, therefore, not available for the work of reconstruction. Mr. Workman said that the prospect of satisfactory business throughout the current year justified the belief that the company would be able to undertake the contemplated changes in the near future.

Board Re-elected

At the meeting only one question was asked, a shareholder inquiring as to the company's unfilled tonnage. To this Mr. Workman replied that the company's output until the end of the year had almost entirely been disposed of. Apart from this, the meeting was of a routine nature and lasted only fifteen minutes. The annual statement was adopted and the board of directors re-elected. At a subsequent meeting of directors George Caverhill was added to the executive committee. The vacant vice-presidency created by the death of the late Sir Wm. Van Horne was not

filled. There are now three vice-presidents—Wm. McMaster, of Montreal, and Sir Henry Pellatt and Col. Frederic Nicholls, of Toronto.

RUSSIAN TRADE TO VANCOUVER

AT a luncheon of the Council of the Board of Trade, held at the Hotel Vancouver recently, Constantin Ragosine, Russian Consul in Vancouver, was the chief speaker, his address dealing with the future trade relations between Canada and Russia, and the important part which he believed Vancouver would play by reason of its position as the chief Canadian seaport on the Pacific.

To Oust Germany

Respecting trade relations between the two countries after the war, Mr. Ragosine said: "To be more precise in describing the interest of Russia in the importation of Canadian goods, I can say I expect from it the liberation of the Russian market from the industrial monopoly of Germany, and which at the same time will bring to the Russian consumer a wider and better choice of goods."

For Western Siberia in particular, he believed, the advent of the Canadian merchant and manufacturer to be desirable, since they would bring with them the technical knowledge and machinery necessary to the development of Russian resources. The position of Vancouver in relation to Vladivostok, he considered, was excellent, and made it possible for goods loaded in Vancouver to be transferred direct to Russian hands.

He predicted that Vancouver would become in time the port through which much of the produce of the United States, as well as Canada, would be handled, and stated it as his belief that the citizens of Vancouver should be fully alive to the great opportunity which he believed lay within their reach.

Mr. Ragosine said that shortly a bureau of information concerning all things Russian will be established in Vancouver for the convenience of merchants, manufacturers and the general public. He laid special emphasis on the necessity of British people acquiring a knowledge of the Russian language, which, he said, was not so formidable as it might look in print. To the way in which they had applied themselves to learning the Russian language he attributed the great influence of Germany in the industrial life in Russia.

United States on Job

He advised a Canadian speaking the Russian language to be placed in the bureau, which he considered should be equipped with a complete set of books dealing with every department of Russian commercial life and law. In all this work he expressed his desire to assist to the utmost of his ability. Speaking of the wide-awake attitude of some American manufacturers with respect to Russian trade, he stated that railway officials from Seattle were at this time over in Siberia studying the needs of that country on the spot.

Mr. Ragosine's address was followed with the closest interest and was accorded a generous measure of applause at its termination.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

Engineering

Hamilton, Ont.—M. Brennen & Sons are in the market for wood-working machinery.

St. Thomas, Ont.—It is reported that the Wabash Railroad will build repair shops here.

Lindsay, Ont. — The G.T.R. propose building a roundhouse, machine shop, etc., to cost $20,000.

Toronto, Ont. — Canadian Allis-Chalmers, Ltd., will build an addition to their factory to cost $6,000.

Ottawa, Ont.—Peter Lyall & Sons Construction Co., are building a frame workshop here, estimated to cost $35,000.

Chesley, Ont.—Two dams near the M. A. Halliday power plant were recently badly damaged as a result of heavy rains.

Parry Sound, Ont.—An explosion on June 21 destroyed No. 3 charging house at the plant of the Canadian Explosives, near here.

St. John, N.B.—The C. P. R. will erect a new 20,000-gallon water tank to furnish a reserve supply for locomatives and for fire fighting.

Collingwood, Ont.—F. Kent and J. A. Sinclair are interested in a company recently organized to manufacture wood and metal specialties.

Toronto, Ont.—The Dodge Mfg. Co., will erect a garage and addition to machine shop at this factory here. The cost will be about $1,800.

Outremont, Que.—Plans have been prepared and accepted by the City Council, for a reinforced concrete community garage, to cost $50,000.

Merlin, Ont.—Natural gas has been found here in considerable quantity by the Southern Ontario Gas Co., who are conducting the drilling operations.

Toronto, Ont.—Work on the addition to the civic barns on Bracondale avenue, for which the permit was recently issued, has commenced. It will cost $21,000.

Welland, Ont.—The Standard Steel Construction Co. have leased the Dominion Canners Co. factory at Port Robinson, and will equip the building as a machine shop.

Cobalt, Ont.—Nipissing Refinery, attached to the high-grade mill, the largest silver refinery in Canada, was gutted by fire on June 21. The damage is extensive and refining of bullion will be prevented for some time.

Medicine Hat, Alta.—The Alberta Foundry & Machine Co. will build an extension to their plant, to cost about $20,000. The new building will be of brick construction, 160 ft. by 120 ft., and will include an iron foundry and machine shop.

Hamilton, Ont.—The Canadian Cartridge Co. has started work on a large addition to its factory on North Sherman Avenue. The building permit has been issued, and calls for a structure, costing $20,000, to be erected by the George Frid Contracting Co.

Oshawa, Ont.—The by-law to fix the assessment of the McLaughlin plant was carried here last Monday by a large majority. It is expected that a large addition to the plant of the Chevrolet Co., will be commenced immediately, which will be constructed to take care of the domestic trade and also with a view to future export business.

Large Power Plant Project.—It is understood that plans will shortly be prepared for the construction of a new municipally-owned hydraulic power plant by the City of Montreal, the cost of the latter, including equipment, being in the neighborhood of one and a half million dollars. Contracts for the buildings and equipment are expected to be placed during the coming winter. The projected installation is in connection with the new aqueduct scheme.

Montreal, Que.—It is understood that the directors of the Wayagamack Pulp & Paper Co. are considering the erection of a sulphite mill to be operated in conjunction with the plant at Three Rivers. The estimates received by the company would indicate the cost of the proposed plant at from $1,000,000 to $1,500,000. Plans in connection with the proposed expansion are said to be fairly well matured, and unless some new development occurs announcement regarding them will be made in the near future.

Renfrew, Ont.—Engineer Kribs, of the Hydro-Electric Commission, has sent a report to the Town Council respecting the investigation of power possibilities made by him for Renfrew at the first and fourth chutes of the Bonnechere River. He finds that at the first chute 1,500 h.p. can be developed, and at the second, 2,000 h.p. The cost of development and delivery in the one case would be $200,000, and in the other, $300,000. Each chute is located within a few miles of Renfrew, which is in pressing need of more electric power.

General Industrial

Toronto, Ont.—L. White & Sons, will make an extension to their factory to cost about $4,000.

Toronto, Ont.—The Hamilton Carhartt Co., have obtained a building permit for a three-storey brick addition to their factory, 535 Queen east to cost $4,000.

Fergus, Ont.—Work is being pushed ahead at the Superior Barn Equipment Co., property, formerly the cold storage plant, near the Grand Trunk station.

Chatham, Ont. — Tenders are being called for the erection of an addition to the American Pad & Textile Co. factory. Adams and Adams of this city are the architects.

Fergus, Ont.—Beatty Bros., Ltd., are making an extension to their premises at St. David Street bridge. When the alterations are completed it will give them 7,000 square feet more floor space.

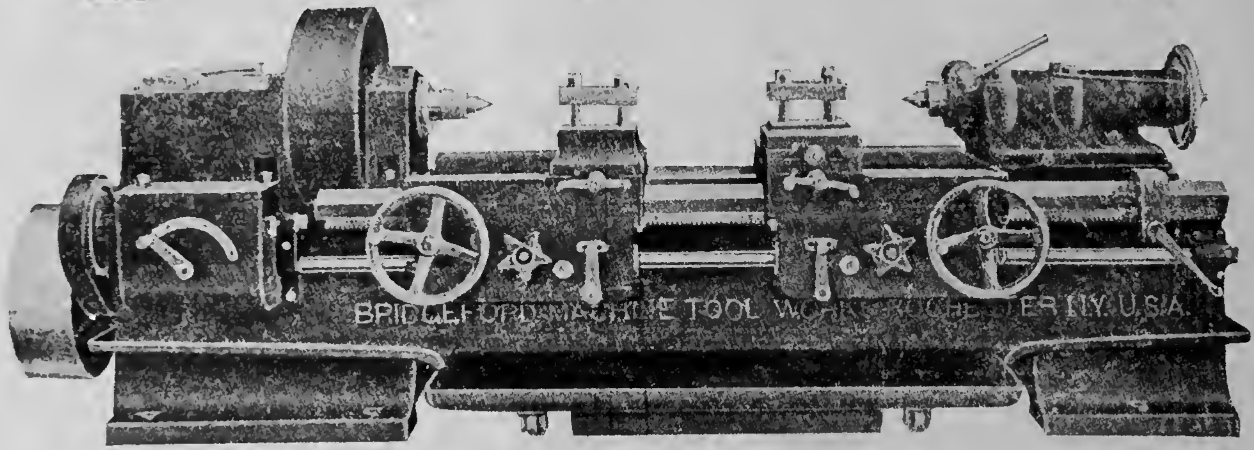
Berlin, Ont.—The Carbo Corporation of Chicago, Ill., will establish a branch here for making steel fence posts. The Nyberg property on King Street East has been secured and building operations will commence shortly.

Toronto, Ont.—Construction work has been commenced on the erection of a new grain elevator by the Campbell Milling Co. on Cawthra street. A building formerly used for rolling grain has been dismantled and removed. Excavation work has been done for the structure. It will cost $10,000.

Brantford, Ont.—The Hampel Paper Box Co. of this town in which Messrs. G. Turbull and G. Hancock, of the Galt Paper Box Co. are associated with W. G. Hampel, manager of the Brantford plant, have decided to erect a new modern box factory here.

Niagara Falls, N.Y.—The McGlashan—Clarke Co. are having a large addition built to their factory at the corner of

The A. R. WILLIAMS MACHINERY CO., Limited



"BRIDGEFORD" 27-in. HEAVY DUTY LATHE

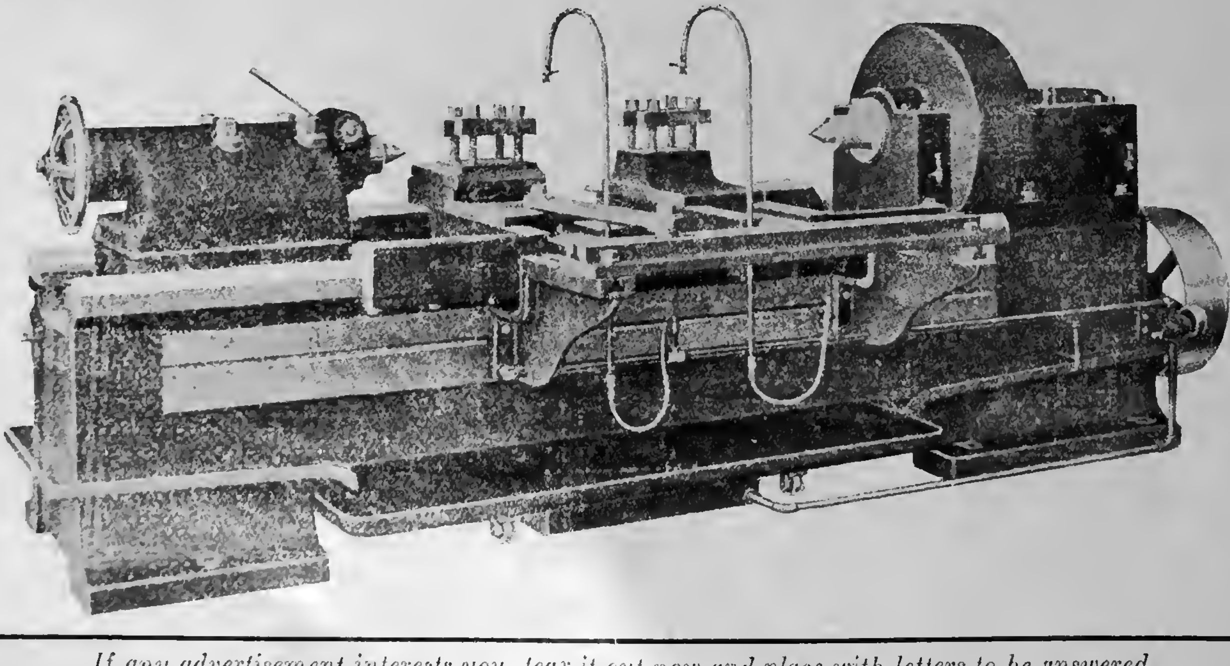
The Ideal Machine for Rough-Turning Shells

This is an especially heavy duty machine, and as shown in the engravings, is arranged for rough-turning 8", 9.2" or 12" shells. Power is transmitted through 8" driving belt, with three instantaneous speed changes through hardened steel gearing. Main driving gear 6½" face. Four instantaneous feed changes—all through cut steel gearing, running in oil. Leading shell manufacturers have from 70 to 120 of these machines in operation—giving remarkably satisfactory results.

Owing to greatly increased facilities, we can make early deliveries on Bridgeford lathes. Write us.

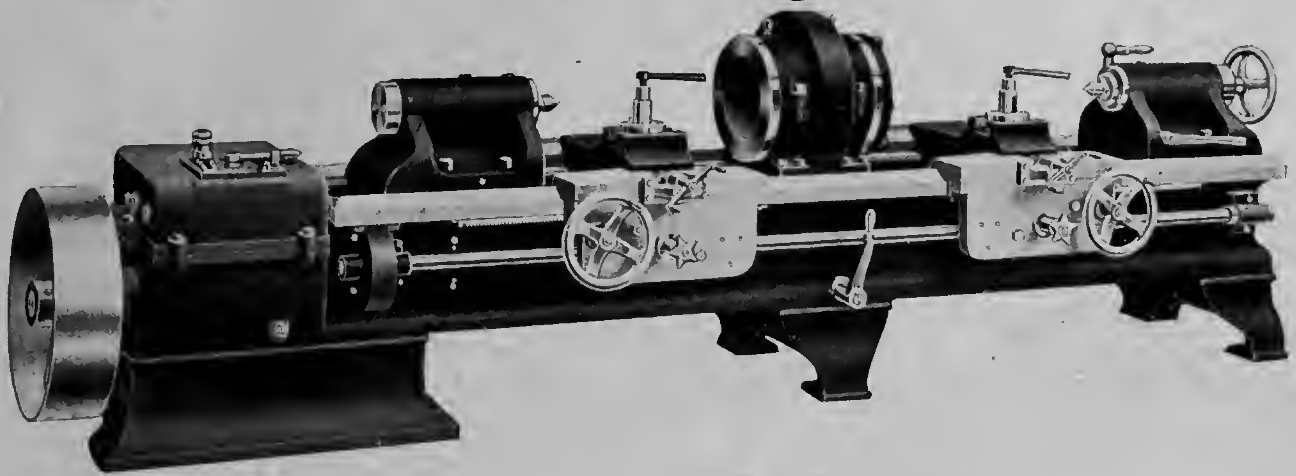
BRIDGEFORD MACHINE TOOL WORKS, 237 Mill Street ROCHESTER, N.Y.

Sales Agents: The A. R. Williams Machinery Co., Limited, 64-66 Front St. W., Toronto



THE A. R. WILLIAMS MACHINERY CO., Limited

The Bridgeford Engine Lathe for Finish Turning



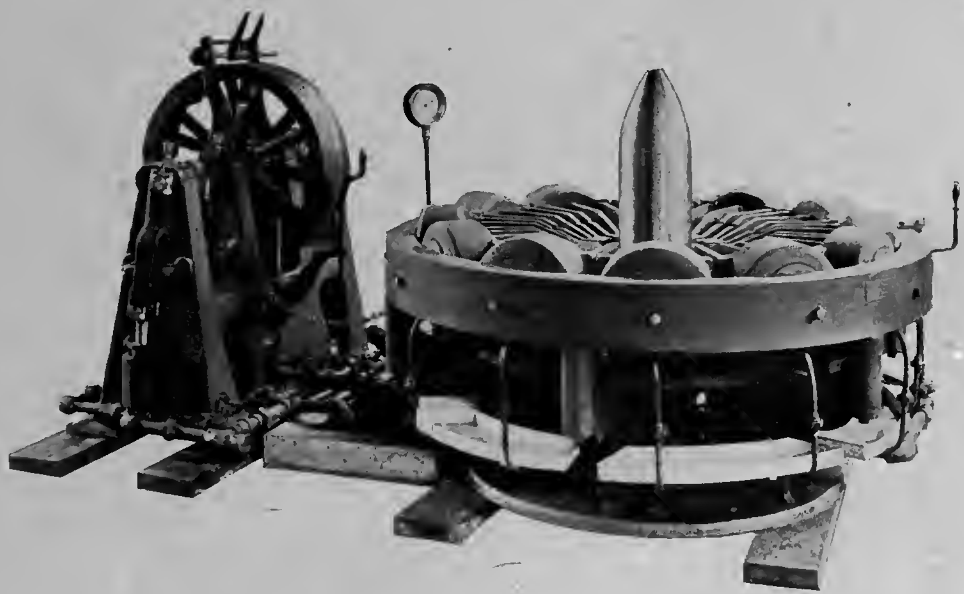
The Bridgeford Double End Machine with adjustable Tailstock at each end is specially adapted for this operation. It is equipped with Compound Tool Slides with European Tool Posts (not illustrated).

The Bridgeford is also equipped for Boring operations and was originally specially designed for this purpose.

Write for illustrated Bulletins giving full data on Bridgeford lathes for Boring, also Rough and Finish Turning.

Sales Agents: The A. R. Williams Machinery Co., Limited, 64-66 Front St. W., Toronto

BIG SHELLS, TOO



FOR compressing bands on shrapnel and high explosive shells there is no more efficient machine built. It is rapid, reliable in operation, and turns out work in strict accordance with government requirements.

Machine consists of a series of hydraulic rams set around inside a steel ring mounted on a cast-iron base, and operated by a belt-driven pump. An advantage peculiar to this machine is the special equipment which prevents the edges of the bands from becoming sheared during the banding operation.

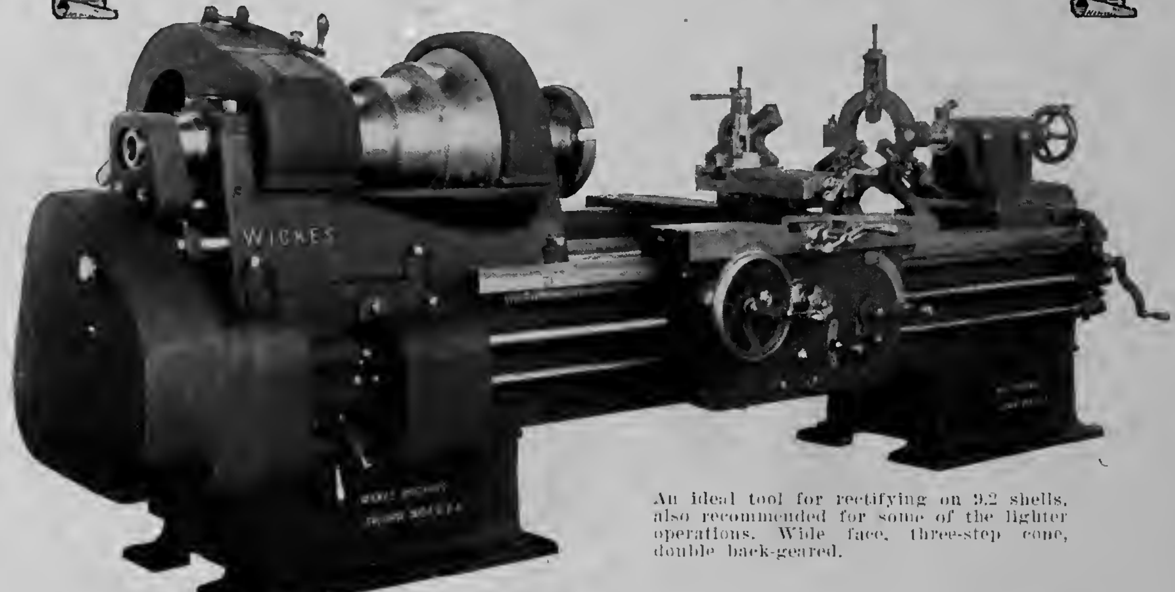
These banding presses are adaptable to a variety of other work, and will make profitable permanent equipment after shell contracts are completed.

West Tire Setter Company, Rochester, N.Y.

Sales Agents: The A. R. Williams Machinery Co., Limited, 64-66 Front St. W., Toronto

THE A. R. WILLIAMS MACHINERY CO., Limited

Wickes 26" Heavy Duty Engine Lathe



An ideal tool for rectifying on 9.2 shells, also recommended for some of the lighter operations. Wide face, three-step cone, double back-geared.

Features—Apron gears, all pinions throughout of steel; English type, 4-stud or compound rest on extra heavy carriage furnished as regular equipment; wide range of thread-cutting and turning feeds. Net weight, 7,700 lbs.; 10' bed; built in 16", 20", 26" and 30" sizes. Write for circulars with full description and prices.

50 years in the game. We know how. **Agents, The A. R. Williams Machinery Co., Limited** **The Wickes Machinery Co., Ltd., Saginaw, Mich.**

Hoskins Furnace for Heating the Copper Band

Hoskins Furnaces are made in Canada and are evidence of Canadian ability to meet unfamiliar manufacturing requirements successfully. The furnace is distinctively a Canadian development and is equal to the best product of foreign manufacture. This furnace is supplied in any size from 4" x 3" x 9" long to 4' x 2' and 8' long. The outstanding features of the Hoskins Furnaces are the temperature control and range from 100° F. to 2000° F., and can be maintained equally, thus eliminating scale. Heating unit is of heavy construction, ensuring long life. Maintenance cost is negligible.

Economy in operation due to construction of chamber which retains the heat. It is cheaper to operate than a gas furnace. Over 2000 in use.

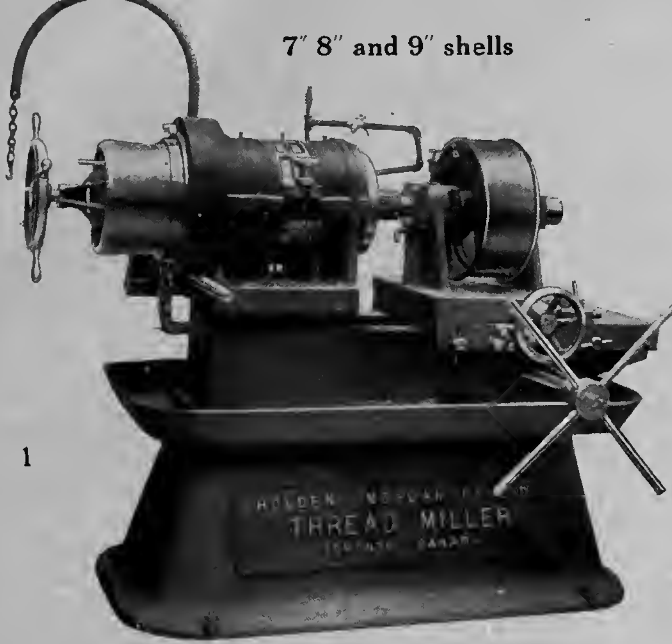
Write for bulletin and get information on capacities, etc.

Sales Agents: The A. R. Williams Machinery Co., Limited, 64-66 Front St. W., Toronto

THE A. R. WILLIAMS MACHINERY CO., Limited

Holden Morgan Thread Millers

7" 8" and 9" shells

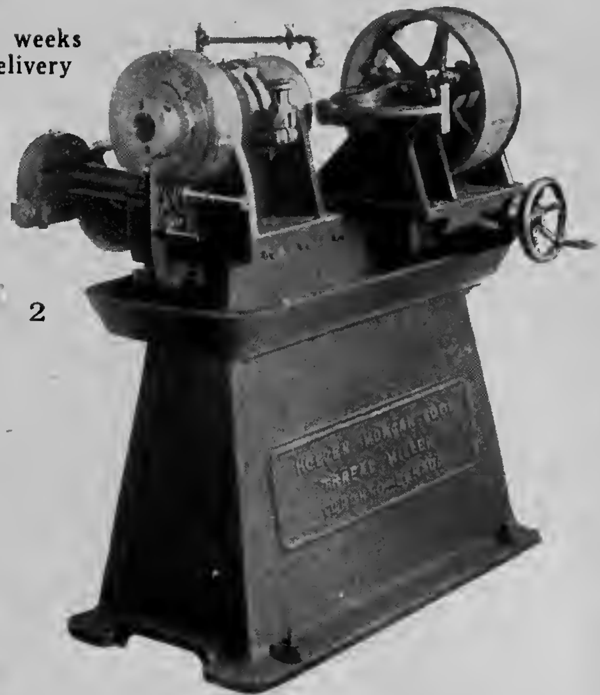


1

The Internal Thread Miller illustrated in figure 1

The shell is carried between two conical surfaces in the interior of the mandrel. This insures the thread being milled perfectly true with the axis of the shell. By this method the shell is held much firmer and truer than by collet chucks. The master screw is chased on the outside of the mandrel, which entirely precludes the possibility of "drunken heads." The milling head is carried in movable carriage and both slides are moved up to positive stops and locked, so that the thread is milled exact.

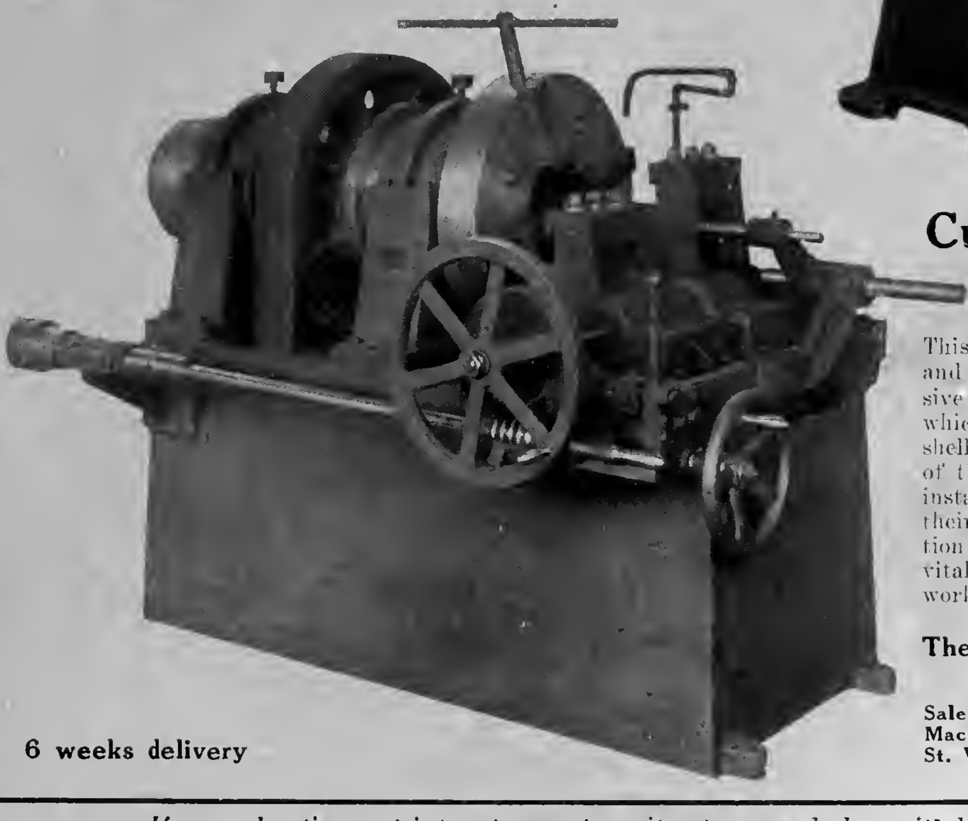
6 weeks delivery



2

The Plug Miller illustrated in figure 2 for 7" to 10" shells

For milling threads on Base Plugs of open Base Shells after being machined. The plug is held perfectly true to the mandrel by a process which can be varied according to the size and type of the plug. The thread is completely milled at one revolution of the mandrel.



6 weeks delivery

Cut-Off and Facing Machine

This machine is made for cutting-off and facing Shrapnel and High-Explosive Shells. The speed and perfection which this machine will cut or face shells from 3" to 12" has induced many of the largest shell manufacturers to install enough of these machines for their requirements. Note the illustration and study the solid build of the vital parts—it's built for work—hard work

The Williams Machine Tool Co.
ERIE, PA.

Sales Agents: — The A. R. Williams Machinery Co., Limited, 64-66 Front St. W., Toronto.

THE A. R. WILLIAMS MACHINERY CO., Limited

The Tool-Room is the Main-spring of the Munition Shop

Ensure smooth and efficient operation in your entire plant by using Le Blond equipment in your Tool-Room.

The Universal Grinder

Le Blond No. 2, for cylindrical, internal, gear cutter and surface grinding with or without power feeds. On order for August and September deliveries.

THE LATHE

14" x 6' Le Blond Lathe with taper attachments and draw-in attachment and collets, relieving attachment and oil pan. If not in stock, always on order. Next lot for July shipment.

Sales Agents:
The A. R. Williams Machinery Co., Limited
64-66 Front St. W., Toronto

We also have for Tool-room equipment, Shapers, Milling Machines, Special Tool Post Grinders and a large variety of labor-saving devices. Consult us about your Tool Room.

Palmer Avenue and Benson Street. The building will be 40 ft. high, 132 ft. long and 44 ft. wide. Except for the curtain walls, which will be of brick, the whole structure will be concrete. Brass Bros. of Niagara Falls, N.Y., are the contractors.

Municipal

Victoria, B.C.—An extension to the water main system is contemplated by the City Council.

Chatham, Ont.—The City Council have decided to call tenders for new equipment for the fire department.

Quebec, Que.—A lighting system will be installed at the Exhibition Grounds here by the Exhibition Commission.

Kingsville, Ont.—A by-law will be submitted to the ratepayers on July 5 to raise $16,000 for the improvement of the waterworks pumping plants.

Burlington, Ont.—The ratepayers on June 16 voted in favor of buying a motor fire truck. The Sherman Auto Garage will supply the equipment.

Orillia, Ont.—A by-law will be prepared to authorize the raising of $110,000 for the purpose of installing three generating units at the new Hydro-Electric plant at Swift Rapids.

Brantford, Ont.—The City Council last Monday gave the third reading to the by-law selling the Grand Valley Railway from Paris to Galt to the Lake Erie & Northern Railway for $30,000.

Stamford Township, Ont.—A by-law will be voted on by the ratepayers on July 10 to authorize an expenditure of $28,000 for the Ontario Distributing Company's equipment in Stamford and Niagara Townships.

Sarnia, Ont.—The City Council has decided to spend $5,000 upon three experimental infiltration basins for the waterworks plant. The basins will be 18 ft. long, 12 ft. wide and 10 ft. deep. Waterworks engineer, James Turner.

Point Edward, Ont.—A by-law will be voted on by the ratepayers on July 3, to authorize raising $7,000 to be used towards the purchase of that part of the distribution plant taken over by the City of Sarnia and within the limits of Point Edward.

Trade Gossip

Orillia, Ont.—The Town Council have awarded a contract to the Boving Hydraulic & Engineering Co., Lindsay, Ont. for three water turbines to cost $29,300.

The Taylor Engineering Co., Vancouver, has secured a contract for six fuel oil engines made by Bollinger, of Stockholm, Sweden, to cost about $95,000.

Jas. H. Mathews & Co., Pittsburgh, Pa., manufacturers of all kinds of making devices and metal signs have appointed The Canadian Fairbanks-Morse Co., their representatives in Canada.

Motor Cars for Australia.—D. H. Ross, Canadian Trade Commissioner at Melbourne, Australia, points out that there is an exceptional opportunity at the present time for Canadian manufacturers of motor cars to secure reliable and energetic representation.

Regina, Sask.—The Saskatchewan Co-operative Elevator Co., are to build 30 new elevators this season at various points and six have been already completed. Including the 30 new elevators, there will be 260 in operation next fall as against 47 in 1911.

Motor Patrol Service.—A school of instruction for candidates for the Royal Naval Auxiliary Patrol Service is being opened in the Jarvis Building, 103 Bay Street, Toronto. Captain Stinson, of the Canada Steamship Lines, is instructor,

and a nominal fee will be charged for the course.

Orillia, Ont.—Orillia Water, Light and Power Commission has announced a further reduction in rates for electric lighting, varying from 7½ to 15 per cent. The reduction applies to both flat and meter rates, and commercial and domestic services, and is effective forthwith.

M. Beatty & Sons, Ltd., Welland, Ont., have been awarded a contract by the Dominion Bridge Co. for two hoisting engines and two vertical boilers, for use at the Intercolonial Railway Car Ferry Terminals, Carleton Point, P.E.I., and Cape Tormentine, N.B.

M Beatty & Sons, Ltd., Welland, Ont., have been awarded a contract by the St. Maurice Construction Co., for the supply of an 8 by 12 triple drum hoisting engine with boom swinger, and one 37 h.p. double drum electric hoist for use on the construction of the St. Maurice River Dam near Sanmaur, Que,

Small Fire at Scotia.—A small fire, damaging the roof of one of the departments of the Nova Scotia Steel & Coal Co., at New Glasgow, occurred on the morning of June 18. The damage was only slight and is fully covered by insurance. Little or no interference with the plant operation resulted.

The Prescott Emery Wheel Co., of Prescott, Ont., has obtained a new charter and will be known in future as the Prescott Mfg. Co. The Company has taken over new premises which will be remodeled and extended for making all kinds of emery and carborundum wheels by vitrified silicate process, and the "Crescent" brand for saws.

Will Make Shells at C.N.E.—Complete shells will be manufactured in the Process building at the Canadian National Exhibition, Toronto. Negotiations have been under way for some time between Dr. Orr and the Government with this end in view, and the consent of the Department of Militia has at last been reluctantly given for an exposition of the methods employed in turning out munitions for the Allies, from the rough forging to the finished article.

Electric Steel in Australia.—The installation of electric furnaces in each of the six capitals of Australia for making cast steel out of scrap is reported. The enterprise is backed by a company, who will erect the first plant in Sydney, the second in Melbourne, and the third in Perth. The furnace is said to be a Swedish type, and an English metallurgist will superintend the plants. The possibilities of such a process are considered excellent, since Australia imports 8,000 to 10,000 tons of steel per year.

Armstrong, Whitworth Board.—At a meeting of the Board of Armstrong, Whitworth of Canada, Ltd., held recently in London, England, H. B. Walker, local manager of the Canadian Bank of Commerce and president of the Montreal Board of Trade, was added to the directorate, as a third Canadian director. The board is made up as follows: President, Sir Edouard Percy C. Girouard; vice-president, George G. Foster, K.C.; directors, Hon. Sir George Herbert Murray, H. H. Smith-Carrington and H. B. Walker; director and general manager, Matthews J. Butler, C.M.G.

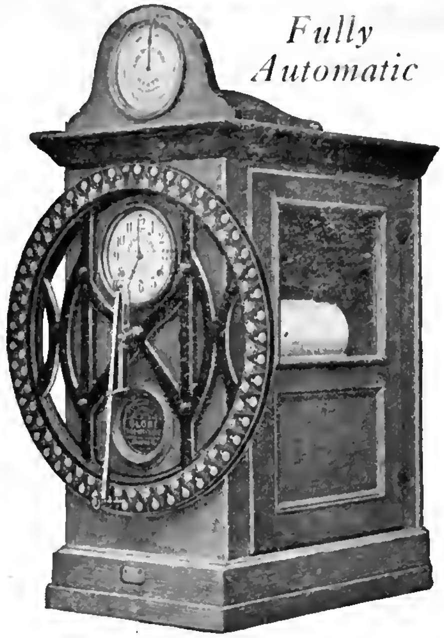
Importing Houses in India.—The Commercial Intelligence Branch of the Department of Trade and Commerce has received from H. R. MacMillan, Special Timber Trade Commissioner of Canada, lists of firms in British India, Burma and Ceylon importing the following articles:—Wood-working machinery; logging equipment; sawmill machinery; Douglas fir; box shooks; shooks for tea chests; doors; bobbins; newsprint for Ceylon. The lists also contain the names of Government officers who are considering the development of Burmese hardwood forests by railways. A copy of these lists will be furnished to any Canadian manufacturer who writes for it, referring to File A-1964.

Benzol Market Firm.—Signs of stiffening in the markets for sulphuric acid, benzol, toluol, and other explosive-making bases, are noticed. The improvement is attributed to the prospect of large orders for such materials being placed within the next few weeks. For some time the markets for these chemicals has been dormant, but of late a steady inflow of small orders has been reported. While no definite inquiries for large tonnages have appeared—except an unconfirmed report that the Dupont Company has closed a big new contract be true—the trade has been given reason to expect that Russia, France, and possibly Britain, will ask for bids on explosives and explosive ingredients in the near future.

McCharles Prize.—A thousand-dollar prize is offered for the second time this year by the Governors of the University of Toronto in recognition of discoveries or invtntions of special merit by Canadians. The prize is known as the McCharles Prize, and is awarded (1) to any Canadian who invents or discovers any new process for the treatment of Canadian ores or minerals after such process has been proved to be of special merit on a practical scale; (2) or for any important discovery, intention or device by any Canadian that will lessen the dangers and loss of life in connection with the use of electricity in suppling power and light; (3) or for any

"You Are Paying For It"

Fully Automatic



"What style of Time Recorder do you use?" asked one manufacturer of another.

"None," said the other, "the old way is good enough for me. I don't spend a cent on them."

"You don't, eh," said the first. "Well, we've tried both ways, and it's a safe bet you're paying for one right now just because you haven't got it."

International Time Recorders

Play no favorites. Its records are automatic. Each man makes his own record and cannot dispute it.

You need pay attention only to the RED figures when making up payrolls—all others are full time.

In face of competition you cannot afford to be without this great and only MECHANICAL check on the labor-time you buy.

It's as fair to the employee as it is to the employer.

Our Service Department

We maintain a Service Department at our factory that is at the call of our users at any minute. This Department employs only expert mechanics, thoroughly trained in the mechanism of all our Recorders. We urge our customers to have their Time Recorders inspected at regular intervals—as no piece of mechanism is proof against abuse.

INTERNATIONAL TIME SYSTEMS

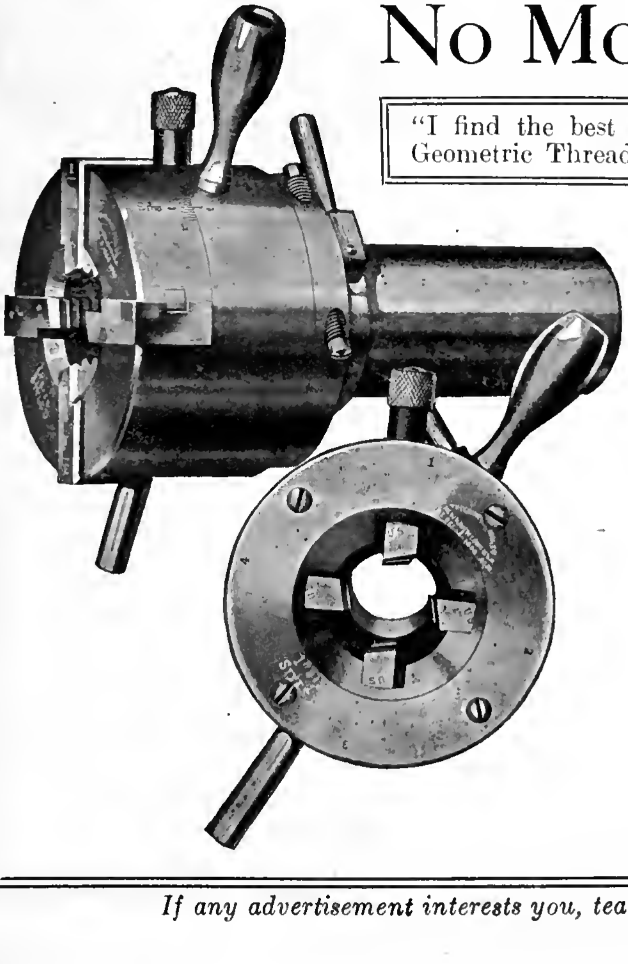
International Time Recording Company of Canada, Limited

F. E. MUTTON, General Manager

Factory
Anderson St., Toronto
Phone Coll. 7393

W. A. WOOD, Jr., Sales Agent
Cartier Bldg., Montreal
McGill and Notre Dame Sts.

No More Broken Threads



"I find the best way to get a full even thread is to use Geometric Threading Dies—no more broken threads."

The above comment was made by a Shop Foreman. His opinion is the opinion of every mechanic who has used Geometric Die Heads.

Geometric Self-opening and Adjustable Screw-cutting Die Heads are made with shanks to fit the turret of all makes of hand and automatic Screw Machines.

When you are ready, take up your threading proposition with us.

Get acquainted through our literature. Tell us the class of threading you have to do, and we will send booklet describing the proper tool to produce it.

The Geometric Tool Co.

New Haven :: :: Conn.

Canadian Agents:
Williams & Wilson, Limited, Montreal
The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg, St. John, N.B.

If any advertisement interests you, tear it out now and place with letters to be answered.

marked public distinction achieved by any Canadian in scientific research.

Threshers in Argentina.—Argentina imported 1,000 threshing machines in the year ended March 31, 1916. The 1915 statistics show a total importation of only 627 threshers, although this was 546 more than in 1914, but many machines ordered to thresh the great wheat crop of 1915 were delayed in arrival by the irregularity of the steamship service, and when they reached Argentine ports in the late winter and the spring of 1916 the immediate need for threshers was largely past, for threshing in Argentina begins in December and is over by March or April. La Razon, of Buenos Aires, in a recent issue, calls attention to the large stock of threshers now available in Argentina, and believes it will be sufficient to thresh the wheat of the coming harvest.—United States Commerce Reports.

Personal

Major T. M. McAvity, of St. John, N.B., has been awarded the Distinguished Conduct Medal.

Richard James, Power Building, Montreal, has secured the Quebec agency of E. C. Humphreys Co., Detroit, Mich., for their pig iron, metals, coke, sand, and clay products.

H. B. Walker, manager the Canadian Bank of Commerce, and president the Montreal Board of Trade, has been elected a director of the Armstrong, Whitworth Co. of Canada.

C. C. Ballantyne, Montreal, vice-president and managing director of the Sherwin-Williams Co. of Canada, becomes Lieut.-Colonel, and will organize the 245th Battalion for overseas service.

W. R. Gilmore, Manager of the Canadian Steel Foundries, Welland, Ont., is resigning to become vice-president and general manager of a steel Company at Benton Harbor, Mich.

W. H. Horwood has been promoted to the position of sales manager with the Canadian Stee' Foundries. **F. E. Smith**, formerly sales manager, is now general superintendent of the plants at Longue Pointe, Point St. Charles, Montreal, and Welland, Ont.

George L. Sprague, of New York, a technical expert, is to be the new principal of the Technical School at Hamilton, Ont., with a salary of $4,000 a year. He was born in Belleville, Ont., and for a time was apprentice supervisor of the American Locomotive Co., and later of the Allis-Chalmers Co. in Milwaukee, Wis.

Sir Edgar R. Bowring, head of the British steamship firm of Bowring & Co., arrived at New York, June 23, on board the White Star liner Adriatic. Among his other engagements while on this side of the Atlantic will be a visit to Canada on business connected with his steamship interests. Asked as to his views on a possible early break in ocean rates, he expressed the opinion that the easing of the freight market recently noted was due to a readjustment of Government controlled cargoes and ships, tending to better systematize the handling of the numerous imports England is receiving from the British Colonies and the United States.

Contracts Awarded

Campbellford, Ont.—A contract has been let to T. McMannus for the construction of the new paper mill here. The main building will be 330 ft. by 38 ft.

Ottawa, Ont.—A contract has been awarded by the Department of Public Works, Ottawa, to Roger Miller & Sons, Toronto, for lock gates and equipment at East River Locks.

St. John, N.B.—The Maritime Dredging & Construction Co. has been awarded the contract for the erection of a second retaining wall and for reclamation work in the new dock area at West St. John.

Building Notes

Sudbury, Ont.—A new public school will be erected on college street. Full information may be obtained from the architect Victor L. Morgan of Sudbury.

Toronto, Ont.—Plans for the new Customs House and examining warehouse which is to be erected on the south-east corner of Yonge and Front streets have been prepared. The building will cover slightly over one acre of ground. It will extend for a distance of 238 feet on Yonge street and 212 feet on Front street, and will be of steel and concrete construction, seven storeys high.

Tenders

Toronto, Ont.—Tenders will be received by the chairman, Board of Control, City Hall, up to July 4, for the supply and delivery of one tank car asphalt, flux oil, for asphalt plant. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont. — Tenders will be received by the Chairman Board of Con-

trol, City Hall, up to July 4, for the supply and delivery of 4-in. stop valves for High Level Pumping Station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont.—Tenders will be received by the Board of Control up to July 4, for the supply and delivery of one 8-in. water-meter. Specification and form of tender may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont.—Tenders will be received up to July 4 for the supply of one 3-h.p. motor, one 20-inch square base self-feed vertical drill with ¾-inch drill chuck and shafting. Samples of the several articles can be seen and forms of tender obtained upon application at the office of the Fire Department, Adelaide Street Fire Hall, Toronto.

Prince George, B. C. — Tenders for power plant equipment for the City of Prince George, B.C., will be received at the office of the city clerk, up to July 8, 1916. Specifications and instructions may be obtained at the office of the city clerk, or at the office of the consulting engineers, DuCane, Dutcher & Co., Rogers Bldg., Vancouver, B.C.

Welland, Ont.—Tenders for repairs to the southerly end of elevator mooring dock at Port Colborne, Welland Canal, will be received until July 14. Specification and form of contract to be entered into can be seen at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the superintending engineer, St. Catharines, Ont.

Toronto, Ont.—Tenders for Examining Warehouse will be received until July 17. Plans, specification and form of contract can be seen and forms of tender obtained at the offices of Thos. A. Hastings, Clerk of Works, Postal Station "F," Yonge Street, Toronto, Ont., R. L. Deschamps, Central Post-office, Montreal, P.Q., and at the Dept. of Public Works, Ottawa.

Ottawa, Ont. — Tenders will be received until July 10 for 163,500 lbs. of galvanized iron telegraph wire, delivered at Montreal, Que., or 128,500 lbs. of same delivered at Kamloops, B.C., and 35,000 lbs. delivered at Vancouver, B.C.; early dates of delivery desired. Specification and forms of tender can be obtained on application to the office of the General Superintendent of the Government Telegraph Service at the Department of Public Works, Ottawa; also at the office of J. T. Phelan, superintendent of Government Telegraphs at Vancouver, B.C.

Ottawa, Ont.—Tenders will be received up to July 4 for the construction of reinforced concrete foundations on wood piles or concrete piles, for 1,000,000 bushel storage capacity grain elevator, working house and track shed at Transcona, Man., separate tenders to be submitted for the foundations with concrete piles and foundations with wooden piles, and tenders may be submitted on either or both designs. Plans, specifications, etc., may be seen at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa; at the office of the Chief Engineers, Moncton, N.B.; at the office of the General Superintendent, Winnipeg, Man.; at the office of the Resident Engineer, Fort William, Ont., and at the office of the J. S. Metcalf Co., engineers, Montreal, P.Q.

Railways - Bridges

Brantford, Ont.—The Lake Erie and Northern Railway station will be a one-storey structure, 76 ft. x 30 ft. red brick with stone trimmings.

Toronto, Ont.—The York County Council propose building a new bridge over the Humber River at Bloor Street at an approximate cost of $25,000.

C.P.R. Extending Lines.—This year the Canadian Pacific Railway has decided to complete the gap of seven miles from Vantage, on the Empress line, south of Moose Jaw, and connecting west of Weyburn at Assiniboia. Vice-president Grant Hall also announces that the line now in operation for 75 miles east of Stirling, Alta., to Fourways, will be extended 10 miles to Manyberries this year.

Classified Advertising Section

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Five cents each insertion when box number is required. Each figure counts as one word. Display rates on application.

FOR SALE

FOR SALE—ONE DAVIS 4½" CUTTING-OFF machine; practically new; been used less than three months; very reasonable. Canadian Linderman Co., Ltd., Woodstock, Ont. (tf)

FOR SALE OR RENT — MACHINE SHOP with railroad siding. Box 208. Canadian Machinery. (4)

FOUNDRY AND MACHINE SHOP WITH stove patterns and stock. Splendid opening. Apply Mrs. Thomas Johnston, Kemptville, Ont. (23)

FOR SALE—BERTRAM WAVING ATTACHment for eighteen pounder shells. First class order. Will sell cheap. Lymburner, Limited, Corner Berri and Commissioners, Montreal, Que. (22)

20,000 LBS. ⅝ GALVANIZED STEEL GUY wire. We can offer this wire at very attractive prices. Winnipeg Machinery Exchange, Sutherland and Gladstone Sts., Winnipeg, Man. (25)

1—2-SPINDLE SHAPER, WOOD TOP, JOHN Ballantyne, Preston, make, used two months. 1 Dynamo, 45 lights, Toronto and Hamilton Electric Co. make. Used five months. Good as new. Box 195, Jordon, Ont. (R.T.F.)

WE HAVE FOR IMMEDIATE DELIVERY ten No. 9 Bardons & Oliver turret lathes; code word "Cedar"; 2½" capacity; exceptional value; price moderate. J. R. Stone Tool & Supply Company, 24 Goebel Building, Detroit, Mich. (24)

FOR SALE—2—16 x 2 POWER FEED TURrets; 1—16 x 1½ Turret with threading attachments; 1—16 x 2 Turret; 1—16 x 8 Engine Lathe; 1—12 x 8 Tool Lathe; 1 Speed Drill. Apply J. A. Harvey, 16 Pearl St. (21)

12-INCH HEAVY DUTY (CANADIAN CORporation) moulder; just used six months; also band saw, shaper, buzz planer, used two years. Apply W. A. Rumney, 36 Fuller Ave., Toronto. (28)

FOR SALE ELECTRIC GENERATOR TO run 60 lamps, 110 volts, 300 r.p.m., including switchboard and indicator, in good condition. Richards Wilcox Canadian Company, London, Ontario. (23)

FOR SALE—NEW HAVEN, 60-INCH SWING Standard Engine Lathe triple geared. 15 ft. bed, hollow spindle, cuts threads 1 to 12. Compound rest, countershaft, steady rest, wrenches, etc. This tool is in excellent shape and owner offers special bargain. Particulars from Winnipeg Machinery Exchange, Sutherland and Gladstone Streets, Winnipeg, Man. (24)

FOR SALE EXCELLENT PLANT FOR THE manufacture of electric passenger and freight elevators, patterns, drawings, blueprints, special and ordinary machinery and parts. We are instructed to offer this entire plant at a fraction of the cost. If you are looking for a splendid manufacturing proposition, write for particulars of this one. Winnipeg Machinery Exchange, Sutherland and Gladstone Streets, Winnipeg, Man. (24)

FOR SALE

Fox Monitor Lathe, 18" x 5' 6", 9-hole turret, cross feed, hollow spindle, 5-step cone; good as new. Plating dynamo, 6 volts, 250 amp.; used only a short time.

PENDRITH MACHINERY COMPANY
970 Queen St. West, Toronto

FOR SALE

TWO ENGINE LATHES FOR SALE—ONE a 18" x 10' McKechnie & Bertram; the other other a double-end pulley lathe 18" x 10' between face plates; both ends completely independent; very suitable for cutting off base and open ends of shells. Turnbull Elevator Mfg. Co., Toronto. (22)

FOR SALE—ELECTRIC PLANT—1 CORLISS engine, 16 x 30; boiler 72" x 14'; 1 dynamo, 1,100 V., 60 K.W. alternating current; 1 dynamo, 500 V., 30 K.W., direct current; transformer, watt meters, shafting, pulleys, belts. All in first-class condition. Sold complete or in part. C. Zulle, Exeter, Ont. (26)

FOR SALE—POND PLANER— 26 X 26 X 7 ft. table, complete in all respects and as good as new, big bargain. Winnipeg Machinery Exchange, Sutherland and Gladstone Streets, Winnipeg, Man. (24)

FOR SALE — THREE HOLDEN-MORGAN threading millers: one arranged for nose threading; two for base threading. One base threader can be changed to 4.5, as it was reduced from this size. Also two Bertram wavers and groovers, and one Martin, all used for 3.3 shells. Canadian Linderman Co., Ltd., Woodstock, Ont. (27)

WANTED

WANTED—ELECTRIC TRAVELLING GANtry crane, span about 57 ft., clearance 50 ft., overhanging at one end; load 15 tons. State full particulars and price. Thor Iron Works, Limited, Toronto, Ont. (27)

WANTED BERTRAM WAVING ATTACHment for 4.5 Shells, with or without Lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson Limited. (R.T.F.)

WANTED — BERTRAM WAVING ATTACHment for 4.5 shells, with or without lathe. Also 18" or 20" turret lathe. Give full particulars and price. Bowes, Jamieson, Limited, Hamilton, Ont. (rtf)

SITUATIONS WANTED

MECHANICAL ENGINEER OPEN FOR position as shop engineer or superintendent; Technical graduate; broad experience in design, construction and production; have practical experience in forging and finishing large and small shells; have highest recommendation for ability to handle men efficiently. Box 205, Canadian Machinery. (25)

MECHANICAL AND ELECTRICAL ENgineer, 16 years' experience, plant layout and maintenance; expert draftsman; wishes change. Box 207, Canadian Machinery. (26)

POSITION WANTED AS SALESMAN, agent, or traveler, for mechanical goods, or machinery, by Chief Engineer, (Marine), thoroughly reliable, of good education and appearance. Box 209, Canadian Machinery. (3)

WANTED

Burned out Tungsten Lamps, late type, drawn wire, 25, 40, 60 and 100 Watts, 110 and 115 volts.

DOMINION TUNGSTEN LAMP FACTORY
ST. CATHARINES, ONTARIO

REPAIRING

ALL KINDS OF MACHINERY REPAIRED, rebuilt and installed. W. H. Sumbling Machinery Co., 643 Yonge Street, Toronto, Ont.

PATENTS

THE PROPRIETOR OF LETTERS PATENT No. 126215, relating to "pump device," desires to dispose of the patent or to grant license to interested parties at reasonable terms, with a view to the adequate working of the patent in Canada. Inquiries to be addressed to the patentees, Aktiebolaget Ingeniorsfirma Fritz Egnell, Stockholm, Sweden. (21)

SITUATIONS VACANT

WANTED—FOREMAN TO TAKE CHARGE of Brass Foundry. Apply with full particulars. Box 203, Canadian Machinery. (21)

WANTED—YOUNG MAN TO HANDLE ADvertising of a line of engineering equipment. Must be prepared to locate in a city of 15,000 population. Salary to start, $70 per month. Box 184, Canadian Machinery.

MECHANICAL SUPERINTENDENT WANTed—for plant of the Starr Manufacturing Co., Limited, Dartmouth, Nova Scotia (near Halifax), operating one 10-inch and one 18-inch train of rolls, producing merchant bar iron. Manufacturers of ice skates and bolts and nuts. Address the company direct, stating age, experience, salary required, giving references, also when services will be available. The Starr Manufacturing Co., Limited, Dartmouth, N.S. (22)

Kindly mention this paper when writing advertiser

IMMEDIATE SHIPMENT

No. 3 Landis Universal Grinder
No. 4 Landis Universal Grinder
Four No. 1½ Landis Internal Grinders
No. 1 Brown & Sharpe Internal Grinder
No. 11 and No. 12 Brown & Sharpe Plain Grinders
Diamond Surface Grinder, 12" x 24"
No. 2 Brown & Sharpe Surface Grinder
Norton Grinder, 6" x 32"
No. 5 Bath Duplex Internal Grinders
Pond Machine Tool Co. Radial, 6 ft.
Niles Semi-Universal Radial, 5 ft.
Bickford Semi-Universal Radial, 5 ft.
Ingersoll Slab Miller, 3 ft. x 12 ft., three heads
Ingersoll Slab Miller, 12" x 48"
Newton Heavy Duty Vertical Miller, 48" circular table
Brainard Vertical Miller
No. 1-B Milwaukee Plain Miller
No. 1 Kempsmith Plain Miller
No. 1 Cincinnati Plain Miller
No. 9 Kempsmith Plain Miller
No. 12 Brown & Sharpe Manufacturing Miller
No. 4 Garvin Profiler
60" Bement-Miles Vertical Mill, two heads
60" Bement-Miles Horizontal Mill, 6" bar
54" Colburn Vertical Mill, two heads
36" Bridgeport Vertical Mill, two heads
36" Bausch Vertical Mill, turret head
30" Bausch Vertical Mill, turret head
Binsse Horizontal Mill, 3½" bar
Binsse Horizontal Mill, 3" bar
Sellers Horizontal Mill, 3" bar
3" x 36" Jones & Lamson Flat Turret Lathe
2" x 24" Jones & Lamson Flat Turret Lathes
No. 5A Potter & Johnston Turret Lathe
7 ft. Bliss Spur and Bevel Gear Cutter
36" Fellows Gear Shaper
125-lb. Scranton Power Hammer
80-lb. Hackney Power Hammer
1,000-lb. Morgan Steam Hammer
600-lb. Bement Steam Hammer
60-lb. Bradley Helve Hammer
No. 4 Mitts & Merrill Keyseater
No. 2 Mitts & Merrill Keyseater
No. 2 Davis Keyseater
Baker Bros. Keyseater, 20" stroke
8" Saunders Pipe Machine
Three 2" Cleveland Full Automatic Screw Machines
1½" Hartford Full Automatic Screw Machine
Six 1¼" Cleveland Full Automatic Screw Machines
Two ¾" Cleveland Full Automatic Screw Machines
⅝" Cleveland Full Automatic Screw Machine
Two Brown & Sharpe Full Automatic Screw Machines, 7/16" capacity
Five No. 2½ Garvin Hand Screw Machines
Bement-Miles Double End Cutting-off Machine, 10" capacity
Manville Geared Knuckle Joint Press
Sellers Hydraulic Wheel Press
26" Kelley Crank Shaper
24" Smith & Mills Crank Shaper
21" Juengst Crank Shaper
20" Steptoe Crank Shaper
16" Ohio Crank Shaper
44" x 44" x 16' Niles Planer, one head
40" x 40" x 8' Pond Machine Tool Co. Planer
26" x 30" x 8' Powell Planer, two heads
30" x 30" x 16' Harrington Planer, one head
30" x 30" x 8' Pond Planer, two heads
17" Miles Slotter
14" Putnam Slotter
12" Sellers Slotter
8" Lowell Slotter
Newton Rotary Saw No. 3
16" Baker Tapping Machine
10 ft. Plate Bending Rolls

AMONG OTHER LATHES, WE HAVE THE FOLLOWING
38" x 16' Fifield, face plate drive
36" x 14' Bement
34" x 16' Perkins
32" x 16' Pond
32" x 16' Niles
30" x 21' Fifield
28" x 18' Gray

New York Machinery Exchange

50 Church St. NEW YORK CITY

High-Grade Used Machinery

ENGINE LATHES

1—16" x 8' Greaves & Klusman Quick-Change Gear Lathe, single back geared.
1—18" x 10' Lodge & Shipley Quick-Change Gear Engine Lathe, single pulley drive, variable speed countershaft, plain block rest.
1—18" x 8' Rahn-Carpenter, plain screw cutting; rebuilt.
1—18" x 10' Bradford, plain screw cutting.
1—24" x 12' American Quick-change, double back-geared; nearly new.
10—22" x 10' Milwaukee, double back-geared, plain screw cutting, comp. rest; new machines. Write or wire for circular and prices.
1—30" x 14" James, raised to swing 38", plain screw cutting.

SCREW MACHINES

5—1¼" Milwaukee Screw Machines, complete. Write for circular.
1—1½" Dreses Geared Friction Head Screw Machine, complete.
1—1½" x 9" Acme Turret Screw Machine, friction geared head, complete; excellent shape.
1—No. 2 Brown & Sharpe Semi-Automatic Wire Feed Screw Machine; rebuilt.
2—⅝" Cleveland Automatics.
1—1" Cleveland Automatic.
1—2" x 24" Jones & Lamson Flat Turret Lathe, cone drive, rebuilt; excellent condition.

MILLING MACHINES.

1—No. 0 Owen Plain Milling Machine; rebuilt.
1—No. 3-H Becker-Brainard Profiler; rebuilt; first-class shape.
1—LeBlond Heavy Design Worm Cutting Attachment for use on No. 2 LeBlond Miller.

GRINDERS

1—No. 60 Heald Cylinder Grinder; rebuilt; 20" table.
1—4" x 30" Pratt & Whitney Automatic Sizing Grinder; rebuilt.
1—12" x 42" Landis Universal Tool Room Grinder; rebuilt.

SHAPERS.

1—24" Lutter & Gies "Milwaukee" Back-geared Crank Shaper; fine shape.
1—20" x 50" Walker Traveling Head Open Side Planer or Shaper.

MISCELLANEOUS.

1—30" Mueller Radial Drill.
1—No. 1 26" Diamond Automatic Face Grinder.
1—2" Bignall & Keeler P.D.Q.C. Pipe Machine.
1—No. ½ Schuchardt & Schutte Gear Hobber.
1—32" x 32" x 6' Pond Heavy Pattern Planer, one head.
1—48" x 48" x 14' Pond Planer, one head.
1—48" x 48" x 16' Pond Planer, one head.
1—No. 3½-A Bliss Toggle Drawing Press; nearly new.
1—60" Stevens Pulley Lathe.
1—48" Brainard Automatic Gear Cutter.
1—17-G New Doty Single End Punch or Shear, 12" throat, capacity 2" in 1".

The E. L. Essley Machinery Co.

551-557 Washington Blvd., Chicago

We have available in our Cleveland Stock.

a number of

LINCOLN TYPE MILLERS

No. 55 FOUR SPINDLE NATIONAL ACME

TWO 2-inch CLEVELAND AUTOMATICS

Etc.

We are in position to offer the entire shell equipment of a large concern.

We buy second-hand tools

The Motch & Merryweather Machinery Company

CLEVELAND DETROIT
CINCINNATI PITTSBURGH

Guaranteed Machinery for Immediate Delivery

TURRET LATHES

12" Windsor, plain head.
16" Lodge & Shipley, plain head.
No. 2 Warner & Swasey, hollow hex.
24" Niles, friction head.
16" Foster, ring turret.
24" Garvin Turret Boring Lathe, back-geared.
28" Gisholt, with taper attachment.

ENGINE LATHES.

14" x 6' Davis, q.c.g.
14" x 6' Fairbanks, c.r. and taper.
14" x 6' Prentice, c.r.
16" x 6' Robbins, c.r.
16" x 6' Sebastian, p.r.
16" x 8' Lodge & Shipley, pat. head.
16" x 10' Greaves & Klusman, c.r.
18" x 6' Bradford, c.r.
18" x 8' Lodge & Shipley, pat. head.
18" x 10' Bradford, c.r. and taper.
18" x 12' Barker, c.r.
18" x 12' American, q.c.g.
18" x 12' Greaves & Klusman, c.r.
20" x 10' Flather, c.r.
21" x 12' Bradford, c.r.
21" x 12' New Haven, c.r.
24"-40" x 12' McCabe, two-spindle.
24" x 16' Schumacher & Boye, c.r.
32" x 12' Pond, c.r.
30" x 14' Reed, c.r.
36" x 12' Hamilton, c.r.
34" x 16' Blaisdell, c.r.
36" x 28' American, c.r.
42" x 24' Fifield, c.r.

SCREW MACHINES.

Pratt & Whitney No. 1 friction gear.
1 3/16" Hartford Automatic.
2" Cleveland Automatic.
2¾" Cleveland Automatic.

BORING MILLS.

52" Niles, car wheel.
48" Colburn, two heads.
60" Colburn, vertical, two heads.
51" Bullard, two swivel heads with motor drive and motor.

PLANERS

Morton Portable.
17" x 17" x 12' Whitcomb, crank.
22" x 22" x 6' Gray, one head.
24" x 24" x 4' New Haven, one head.
24" x 24" x 6' Pond, one head.
24" x 24" x 6' Gray, one head.
30" x 30" x 8' Woodward & Powell, one head.
36" x 36" x 10' Powell, one head.
36" x 36" x 12' Powell, two heads.
36" x 36" x 16' Sellers, one head.
39" x 39" x 12' New Haven, one head.
40" 40" x 12' New Haven, one head, one side head.
54" x 54" x 14' Pond, two heads, arranged for motor drive.

MILLING MACHINES.

No. 12 B. & S., plain.
No. 2 Cincinnati, plain.
No. 2 P. & W., Lincoln Type.
No. 23 Fox Miller.
No. 13 P. & W., Lincoln Type.
Garvin No. 1½ Universal.
No. 3 LeBlond, plain.

GEAR CUTTERS.

24" x 7" Gould & Eberhardt, for spur gears.
24" x 9" Gould & Eberhardt, for spur, bevel and face gears.
36" Walcott.

SHAPERS.

15" Hendey, friction.
16" Niles, back-geared.
18" Barker & Chard, back-geared.

HAMMERS.

100-lb. American, steam post.
100-lb. Pittsburg, single frame, steam.
200-lb. Bliss, drop.
300-lb. Bliss, drop.
800-lb. Morgan, single frame, steam.

PRESSES.

No. 77A Toledo, o.b., straight side.
No. 3 Delivouk & George, o.b., inclinable.
No. 3 Toledo, o.b.
No. 430 McDonald, double crank.
No. 133 Ferracute, double action.
No. 95 Bliss, double crank.
No. 77A Toledo, o.b.

DRILLS.

5' Dreses Full Universal Radial.
3' Economic Plain Radial.
2½' Dreses Radial.
No. 30-C Baush, 12-spindle.

Advise us what you contemplate purchasing and we will keep you posted on our stock.

The H. A. Stocker Machinery Company, 566-572 W. Randolph St., CHICAGO, ILL.

MACHINE TOOLS

Lathes, Boring Mills, Grinders, Every Make and Description of MACHINE TOOLS!

We give below a few samples:—

LATHES.

Three 16 x 8' Pratt & Whitney, Q.C.G., C.R., H.S., taper attachment, each $1000
One 16 x 8' Pratt & Whitney, C.R., taper attachment 1250

PLANERS.

72" x 72" Fitchburg, with 2 heads 1500
52" x 52" x 24' Betts, with 2 heads 1500
38" x 38" x 16' Pond, 2 heads, heavy duty 2000
42" x 15' Gleason, heavy pattern, adjustable housing, max. distance between the housings 56", 2 heads 1500
36" x 36" x 8' Gray, single head, motor-driven 1250
The above machine, belt-driven 1000
Two (2) 36" x 36" x 8' very heavy Powell with 2 heads, all steel gearing, arranged for motor or belt drive, weight 2,000 lbs., suitable for heavy forging work, each 1250
36" x 36" x 10' Sellers, latest pattern, 2 heads 2000
36" Detrick & Harvey Open Side Planer, 13' table 2000
Pease 24" x 24" x 6', one head 450

HORIZONTAL BORING MACHINES.

Lucas Horizontal Boring Machine 2000
Espen Lucas Floor Boring Machine, 4" bar, 40" travel, bores to centre of 12', 72" vertical travel, saddle on column 2750
Betts, Horizontal, 4" bar, 36" automatic feed, bores to centre of 60" 1500

RADIAL DRILLS.

4' Western, Full Universal, good as new 900
3' Harrington, plain 250
3½' Lambert, plain 200
42" Baush, latest pattern, heavy type 500
4' Dreses, motor-driven, with tapping attach 650
5' Pond 750
5½' Niles, semi-Universal 925

GRINDERS.

Landis, plain, capacity 8 x 42" 1400
Landis, No. 11, plain, capacity 7 x 36" 1250
Brown & Sharpe Universal, capacity 12 x 30" 1400
Springfield Universal, 16 x 40" 850
Two No. 5 Rivet, large assortment of collets, each 550

METAL CUTTING SAWS.

8" Higley 250
No. 2 Newton with 24" inserted tooth saw blade 400
Newton Cold Saw, takes 28" saw, 48" travel of saw carriage 600
Large Newton Cold Saw, takes 32" blade 750

TURRET LATHES.

No. 6 Brown & Sharpe, geared friction head, 1⅝" hole in spindle 500
18 x 6 Warner & Swasey, 2" H.S. 600
20 x 8 Beaman & Smith, back geared, with separate carriage 500
20 x 7 Lodge & Shipley, 2¼" H.S., geared friction head 650
21" Bogert, back-geared, friction head, 2½" H.S. 650
Jones & Lamson 2 x 24 Flat Turret, geared friction head 850
22½" Reed, geared friction head, 2" H.S. 675
Two (2) Potter & Johnson, full automatic chucking machines, geared head, fully enclosed, each 1000

VERTICAL BORING MILLS.

42" Baush, 2 heads, motor drive 1350
51" Bullard, 2 heads, motor drive 1750
54" Betts, single head 500
84" Pond, heavy pattern, 2 heads 2700

AUTOMATIC SCREW MACHINES.

Three (3) No. 2 Brown & Sharpe, each 500
Three (3) 2¼" Gridley Single Spindle, motor driven, each 1500
National Acme, 4-spindle, 3-16" 1250

MILLING MACHINES.

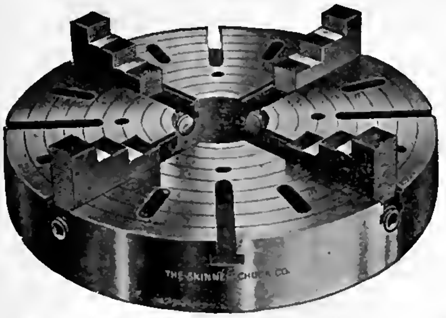
No. 5-B Becker Horizontal, plain 1250
No. 5 Garvin, plain 1000
No. 2 Beaman & Smith, one vertical and one horizontal spindle 2000

WRITE FOR OUR STOCK LIST

THE CO-OPERATIVE USED MACHINERY COMPANY

50 Church St., Suite 482, Telephone Cortlandt 665, New York — Warehouse, 408 Claremont Ave., Jersey City, N J.

Skinner Independent Chucks



FOR HIGH SPEED WORK

IRON OR STEEL BODY

The last word in chuck construction.

Wide jaws: hardened steel thrust bearings; adjusting screws of large diameter, threaded full length; jaws ground after hardening, etc.

Write us to-day for prices.

THE SKINNER CHUCK COMPANY, New Britain, Conn.

New York Office: 94 Reade St., N.Y.

Factory and Main Office: New Britain, Conn.

London Office: 149 Queen Victoria Street

San Francisco Office: Rialto Building.

The Asa S. Cook Company

HARTFORD, CONN.

Rivet Machines

WITH

Absolutely Accurate Automatic Feed

In sizes to work blanks up to 6 inches long, 7/16 in. diameter stock. Capacity from 80 to 200 rivets per minute, according to size.

WRITE FOR COMPLETE PARTICULARS.

THOUSANDS of Dollars are saved every year by our clients, because we have experts who are trained to make exhaustive tests of all the material you are purchasing, whether raw material or finished products.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

Branch Offices and Laboratories:

TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW.

VIKING

WATERPROOF CEMENT LEATHER BELTS

Will Save You Much Money, Time, Trouble and Worry

"Viking" Belts are just in their element when in wet places and under adverse conditions.

A trial will convince you that they are all-round savers.

Write for particulars.

J. C. McLaren Belting Co., Limited, Canada

MONTREAL TORONTO WINNIPEG

If YOU are Making SHRAPNEL

You need a

TWINKO

TRADE MARK — THWING INSTRUMENT COMPANY

Indicating or Recording PYROMETER

It will insure the metal being treated at the right temperature. Don't take any risks.

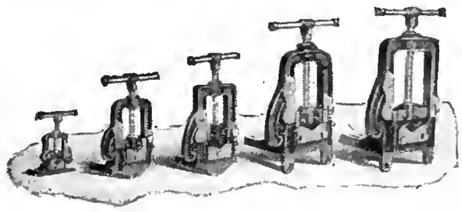
Write for Bulletins Nos. 6 and 7.

THWING INSTRUMENT COMPANY

441 N. 5th St., Philadelphia, Pa.

Canadian Representative: JAS. DE VON, 227 Davenport Road, Toronto, Ont.

JUNIOR No. 0 No. 1 No. 2 No. 3



ARMSTRONG MALLEABLE IRON HINGED PIPE VISES

WITH HARDENED STEEL JAWS

Manufactured By

THE ARMSTRONG MFG. CO.

328 KNOWLTON ST., BRIDGEPORT, CONN., U.S.A.

NEW YORK, U.S.A., 248 CANAL ST.

BRISTO

PATENTED SAFETY SET SCREWS

The BRISTO Patented Safety Set Screw protects itself from all danger of the metal spreading and the screw becoming cracked or split. The dove-tailed design of screw and wrench CONTRACTS the metal under pressure. The harder you twist the wrench the more the metal of the screw is compressed.

Write for Bulletin I-804

THE BRISTOL COMPANY

WATERBURY, CONN. - U.S.A.

RIVETED STEEL TANKS FOR EVERY PURPOSE

OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE - BINS & HOPPERS

Canadian Machinery BUYERS DIRECTORY

If what you want is not listed here write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index facing the inside back cover, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

ABRASIVE MATERIALS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Carborundum Co., Niagara Falls, N.Y.
Foss & Hill Machy Co., Montreal.
Gardner Machine Co., Beloit, Wis.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.

ACETYLENE
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

ACETYLENE GENERATORS
L'Air Liquide Society, Montreal, Toronto.

ACCUMULATORS, HYDRAULIC
Can. Boomer & Boschert Press Co., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Wks., Chicago.
Lachapelle, J. D., & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
Peacock Bros., Montreal, Que.
Smart-Turner Mach. Co., Hamilton, Ont.
William R. Perrin, Ltd., Toronto.

AIR RECEIVERS
MacKinnon, Holmes Co., Sherbrooke, Que.
Newman Mfg. Co., Cincinnati, Ohio.

AIR WASHERS
Can. Blower & Forge Co., Berlin, Canada.

ALUMINUM
Tallman Brass & Metal Co., Hamilton.

ALLOYS, STEEL
H. A. Drury Co., Ltd., Montreal.
Hawkridge Bros. Co., Boston, Mass.
Vanadium Alloys Steel Co., Pittsburg, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

ARBORS
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

ASSEMBLING STANDS
Skinner Chuck Co., New Britain, Conn.

AUTOGENOUS WELDING AND CUTTING PLANTS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

AUTOMATIC MACHINERY
Baird Machine Co., Bridgeport, Conn.
Cook, Asa S., Hartford, Conn.
Dominion Machinery Co., Toronto.
Gardner, Robt., & Son, Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Roelfson Machine & Tool Co., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

AUTOMATIC WOOD SCREW MACHINES
Asa S. Cook Co., Hartford, Conn.

BABBITT METAL
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Canada Metal Co., Toronto.
Foss & Hill Machy Co., Montreal.
Hoyt Metal Co., Toronto.
Magnolia Metal Co., Montreal.
H. W. Petrie, Toronto.
Tallman Brass & Metal Co., Hamilton.

BALL BEARINGS
Canadian Fairbanks-Morse Co., Montreal.
Chapman Double Ball Bearing Company, Toronto.
Lyman Tube & Supply Co., Montreal, Que.

BALL BURNISHING MACHINES
John Millen & Son, Montreal.
H. W. Petrie, Toronto.

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

BARS, BORING
Charles F. Elmes Eng. Works, Chicago, Ill.
Niles-Bement-Pond Co., New York.

BAR BENDERS AND STRAIGHT EDGES
Steel Bending Brake Works, Ltd., Chatham, Ont.

BAR BINDERS, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago, Ill.

BELT LACERS
Clipper Belt Lacer Co., Grand Rapids, Mich.

BELT DRESSING AND CEMENT BELT LACING, LEATHER
Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy Co., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.

BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Toronto.

BELTING, LEATHER
Canadian Fairbanks-Morse Co., Montreal.
Dominion Machinery Co., Toronto.
Graton & Knight Mfg. Co., Worcester, Mass.
Main Betling Co., Montreal.
McLaren, J. C., Belting Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Toronto.

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.
Main Belting Co., Montreal.
H. W. Petrie, Toronto.
F. Reddaway & Co., Montreal.

BENDERS, ANGLE AND TEE IRON
Can. Blower & Forge Co., Berlin, Canada.

BENDING MACHINERY
John Bertram & Sons Co., Dundas.
Bertrams, Limited, Edinburgh, Scotland.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown-Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Berlin, Canada.
Dominion Machinery Co., Toronto.
Charles F. Elmes Eng. Works, Chicago.
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo, O.
Steel Bending Brake Works, Chatham, Ont.

BILLET MARKERS
Matthews, Jas. H., & Co., Pittsburgh, Pa.

BINS, STEEL
Dennis Wire & Iron Works Co., Ltd., London, Canada.
MacKinnon, Holmes Co., Sherbrooke.
Toronto Iron Works, Ltd., Toronto.

BLOCKS, LIFTING
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.

BLOWERS
Can. Blower & Forge Co., Berlin, Canada.
Sheldons, Ltd., Galt, Ont.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

BOARTZ
Geo. A. Joyce Co., Ltd., New York, N.Y.

BOILERS
Can. Locomotive Co., Kingston, Ont.
MacKinnon, Holmes Co., Sherbrooke, Que.
H. W. Petrie, Toronto.

BOILER MAKERS' SUPPLIES
Jno. F. Allen Co., New York.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Wells Brothers Co., Greenfield, Mass.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

BOLT AND NUT MACHINERY
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, O.
H. W. Petrie, Toronto.
A. R. Williams Machinery Co., Toronto.

BOLT THREADING MACHINERY
Cook, Asa S., Co., Hartford, Conn.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
H. W. Petrie, Toronto.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Dominion Machinery Co., Toronto.
Garlock-Machinery, Toronto.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Stow Mfg. Co., Binghampton, N.Y.

BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy Co., Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BOXES, TOTE
Cleveland Wire Spring Co., Cleveland.

BRACKETS, ADJUSTABLE ELECTRIC LIGHT
Darling Bros., Ltd., Montreal, Que.
McCroskey Reamer Co., Meadville, Pa.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Works, Ltd., Chatham, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

BRASS RODS
Brown's Copper & Brass Rolling Mills, New Toronto.

BRASS WORKING MACHINERY
Dominion Machy. Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
Warner & Swasey Co., Cleveland.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

BRICK MACHINERY
Sheldon's, Ltd., Galt, Ont.

BRIDGES, RAILWAY AND HIGHWAY
MacKinnon, Holmes Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto.

BUBBLERS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

BUCKETS, CLAM SHELL, CRAB AND DUMP
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

BUCKETS, ELEVATING AND HOISTING
Banfield, Edwin J., Toronto.

BUFFING AND POLISHING MACHINERY
Foss & Hill Machy. Co., Montreal.
Lachapelle, J. D., & Co., Montreal, Que.
New Britain Machine Co., New Britain, Conn.

BULLDOZERS
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.

BURNERS, ENCLOSED FLAME GAS.
Oven Equipment & Mfg. Co., New Haven, Conn.

BURNERS, FUEL OIL AND NATURAL GAS.
Lachapelle, J. D., & Co., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

BURRING REAMERS.
Wells Brothers Company, Greenfield, Mass.

BURRS, IRON AND COPPER.
Parmenter & Bulloch Co., Gananoque.

BUTTERISERS.
Wells Brothers Company, Greenfield, Mass.

CABLE, RUBBER-COVERED
Lachapelle, J. D., & Co., Montreal, Que.

CANNERS' MACHINERY.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CARS, INDUSTRIAL.
Can. Blower & Forge Co., Berlin, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CASTERS, HEAVY TRUCK
Aikenhead Hardware Co., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER
Bawden Machine Co., Toronto, Ont.
Cunningham & Son, St. Catharines, Ont.
Alexander Fleck, Ltd., Ottawa.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, GRAY IRON.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.

CASTINGS, STEEL CHROME AND MANGANESE STEEL.
Can. Steel Foundries, Ltd., Montreal, Que.
Dominion Steel Foundry Co., Ltd., Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Galt Malleable Iron Co., Galt.
Peacock Bros., Montreal, Que.

CASTINGS, MALLEABLE.
Can. Steel Foundries, Ltd., Montreal, Que.
Galt Malleable Iron Co., Galt.

CASTINGS, NICKEL STEEL.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.

CEMENT, DISC WHEEL.
Gardner Machine Co., Beloit, Wis.

CEMENT, IRON.
Shelton Metallic Filler Co., Derby, O.

CEMENT MACHINERY.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.

CENTRE REAMERS.
Wells Brothers Co., Greenfield, Mass.
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.

CENTRIFUGAL MACHINES.
D'Olier Centrifugal Pump & Machine Co., Philadelphia, Pa.

CHAIN BLOCKS.
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Lyman Tube & Supply Co., Montreal, Que.
H. W. Petrie, Toronto.

CHEMISTS.
Can. Inspection & Testing Laboratories, Ltd., Montreal.
Toronto Testing Laboratory, Ltd., Toronto.

CHIP CENTRIFUGALS.
D'Olier Centrifugal Pump & Machine Co., Philadelphia, Pa.

CHUCKS, AERO, AUTOMATIC.
Garvin Machine Co., New York.

CHUCKS, DRILL, LATHE AND UNIVERSAL.
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Berlin, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Milholland, W. K., Co., Indianapolis, Ind.
McCrosky Reamer Co., Meadville, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
H. W. Petrie, Toronto.
Skinner Chuck Co., New Britain, Conn.
Thomas Elevator Co., Chicago, Ill.
D. E. Whiton Machine Co., New London, Conn.
Wells Brothers Co., Greenfield, Mass.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS.
Can. Blower & Forge Co., Berlin, Canada.
Aikenhead Hardware Co., Toronto, Ont.

CHUCKS, MAGNETIC.
Heald Machine Co., Worcester, Mass.

CHUCKS, RING WHEEL.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES.
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Turner Machine Co., Danbury, Conn.
Warner & Swasey Co., Cleveland, O.

CLUTCHES.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY.
Allen, John F., Co., New York, N.Y.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COKE AND COAL.
Hanna & Co., M. A., Cleveland, O.

COLLECTORS, PNEUMATIC.
Can. Blower & Forge Co., Berlin, Canada.
Sheldons, Limited, Galt.

COLLETS
Manufacturers' Equipment Co., Chicago, Ill.
McCrosky Reamer Co., Meadville, Pa.

COMPRESSORS, AIR.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Eureka Pneumatic Spray Co., New York, N.Y.
Jenckes Mach. Co., Sherbrooke, Que.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.
The Smart-Turner Machine Co., Hamilton.
Zin-Ho Mfg. Co., Chicago.

CONCRETE REINFORCEMENT.
Canada Wire & Iron Goods Mfg. Co., Hamilton.

CONDENSERS.
Can. Blower & Forge Co., Berlin, Canada.
Darling Bros., Ltd., Montreal, Que.

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
Dominion Machy. Co., Toronto, Ont.
Lachapelle, J. D., & Co., Montreal, Que.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

CONVEYOR MACHINERY.
Banfield, Edwin J., Toronto.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Can. Matthews Gravity Carrier Co., Toronto, Ont.
H. W. Petrie, Toronto.
The Smart-Turner Machine Co., Hamilton.

COPING MACHINES.
Can. Blower & Forge Co., Berlin, Canada.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

CORNICE BRAKES.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Steel Bending Brake Works, Chatham.

COUNTERBORES AND COUNTERSINKS.
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., Greenfield, Mass.

COUNTERSHAFTS.
Baird Machine Co., Bridgeport, Conn.
Wells Bros. Co., Greenfield, Mass.

COUPLINGS.
Gardner, Robt., & Son, Montreal.

COUPLINGS, AIR HOSE.
Cleveland Pneuatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANE PULLERS.
Crane Puller Co., Hopedale, Mass.

CRANES, LOCOMOTIVE.
Davenport Locomotive Works, Davenport, Iowa.
Northern Crane Works, Walkerville.

CRANES, GANTRY.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, PORTABLE.
Aikenhead Hardware Co., Toronto, Ont.
Davenport Locomotive Works, Davenport, Iowa.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Peacock Bros., Montreal, Que.
Whiting Foundry Equipment Co., Harvey, Ill.
Zin-Ho Mfg. Co., Chicago.

CRANES, ALL KINDS.
Davenport Locomotive Works, Davenport, Iowa.
Hepburn, John T., Ltd., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
Zin-Ho Mfg. Co., Chicago.

CRIMPS, LEATHER.
Graton & Knight Mfg. Co., Montreal.

CUPOLAS.
Can. Blower & Forge Co., Berlin, Canada.
Northern Crane Works, Walkerville.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS.
Sheldon's, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS.
Cincinnati Milling Machine Co., Cincinnati.
Garvin Machine Co., New York.

CUTTERS, ANGLE, TEE IRON AND BAR
Can. Blower & Forge Co., Berlin, Canada.

CUTTERS, FLUE.
Cleveland Pneuatic Tool Co. of Canada, Toronto.

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Morse Twist Drill and Machine Co., New Bedford
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Indianapolis, Ind.

CUTTING COMPOUND AND CUTTING OIL.
Can. Economic Lubricant Co., Montreal.
Cataract Refining Co., Buffalo, N.Y.
Racine Tool & Machine Co., Racine, Wis.

CUTTING-OFF MACHINES.
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Machinery, Toronto.
Garvin Machine Co., New York.
Geo. Gorton Machine Co., Racine, Wis.
Hurlbut, Rogers Machinery Co., South Sudbury, Mass.
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Peerless Machine Co., Racine, Wis.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Racine Tool & Machine Co., Racine, Wis.
Root & Van Dervoort Engineering Co., East Moline, Ill.
L. S. Starrett Co., Athol, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

DAMPER REGULATORS.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Darling Bros., Ltd., Montreal, Que.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.

DESIGNERS, SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.

DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Geo. A. Joyce Co., Ltd., New York.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H. & Co., Pittsburgh, Pa.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Mfg. Co., Bridgeport, Conn.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs & Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Greenfield Tap & Die Corporation, Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR BIT BRACE USE
Wells Brothers Co., Greenfield, Mass.

DIE SINKERS
Cook, Asa S., Co., Hartford, Conn.
Garvin Machine Co., New York.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Wells Brothers Co., Greenfield, Mass.

DIE SINKING PRESSES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.

DIES FOR SCREW PLATES
Wells Brothers Co., Greenfield, Mass.

DIES, SHEET METAL WORKING
Acton Tool & Stamping Co., Toronto, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Conn.
Coleman Fare Box Co., Toronto, Ont.
Fisher, A.D., Mfg. Co., Toronto, Ont.
Worth Engineering Co., Toronto, Ont.

DIES, SCREWS AND THREAD
Armstrong Mfg. Co., Bridgeport, Conn.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.

PATTERNS

WOOD OR METAL PATTERNS AND MODELS

Prompt Attention and Satisfactory Work Guaranteed

Estimates Furnished

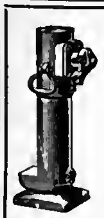
MOODY & HAWLEY

53 Nelson Street - - - - Toronto, Ontario, Canada

PRESSES—ALL TYPES

Press Attachments, Automatic.
Metal and Wire Forming Machines.
Tumblers—Large Line.
Burnishing Machines, Grinders.
Special Machines.

Baird Machine Co., Bridgeport, Conn. U.S.A.



NORTON JACKS

For all kinds of heavy lifting

Send for complete catalogue showing 50 styles
10 to 100 tons capacity.

Made only by

A. O. NORTON, LIMITED

Coaticook, Prov. Quebec - - Canada

PULLEYS

ALL WOOD—COMBINATION—IRON—STEEL

Every pulley fully guaranteed.
Write for interesting printed matter.

The Positive Clutch & Pulley Works, Ltd.

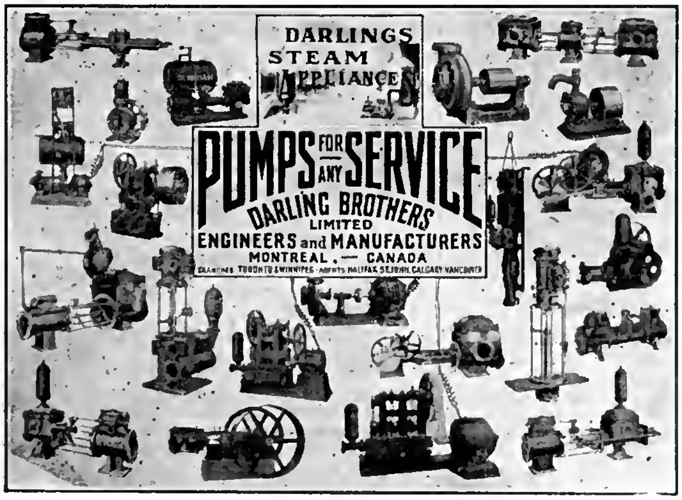
Montreal Factory: Aurora, Ont. Toronto

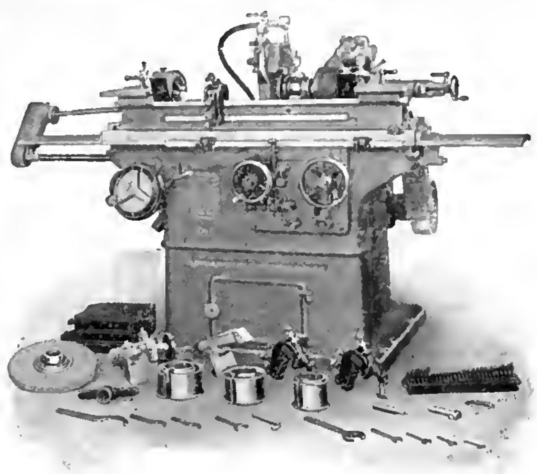
GEARS AND GEAR CUTTING SPROCKETS AND CHAINS

In stock and to order any size from one-quarter inch to six-foot in diameter, any material. Estimates and gear advice cheerfully furnished.

Grant Gear Works, Inc., 151 Pearl St. Boston, Mass. U.S.A.

G. B. GRANT





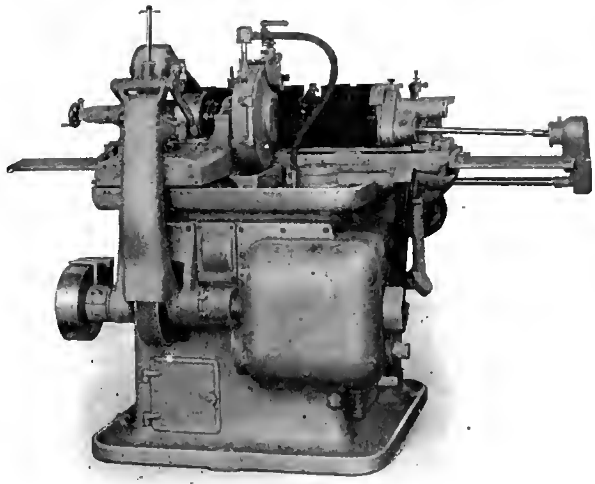
Here are two reasons why our new design *NOS. 10 and 11 PLAIN GRINDING MACHINES* will give you maximum production and economy.

Simple, Centralized Work Control

Just three levers grouped around a dial. One instantly stops and starts work and table travel together. The other two regulate work speed and table travel. Moving them around the dial like controller handles, while work is running, causes speed or traverse to increase or decrease, not by jumps, but steadily. The multiple friction disk mechanism gives a finely graduated range so that any feed and speed combination desired is instantly available.

Single Pulley, Constant Speed Drive

Complicated overhead works eliminated. Use a constant speed motor attached to machine base for driving if desired. All speed and feed changes are within machine. It is thus compact and not difficult to arrange for on shop floor. Wheel speed changes made by means of split spindle pulleys changed without shifting belt. Capacities of machine, 6" x 20", and 6" x 32". May we send an illustrated circular describing the many cost-cutting features?



Brown & Sharpe Mfg. Co.

PROVIDENCE, R.I., U.S.A.

Manufacturers of Milling Machines, Grinding Machines, Screw Machines, Gear Cutting Machines, Test Tools, Machinists' Tools, Cutters.

Canadian Agents: THE CANADIAN FAIRBANKS-MORSE CO., Limited, Toronto, Montreal, Winnipeg, Calgary, Vancouver, St. John, Saskatoon

If any advertisement interests you, tear it out now and place with letters to be answered.

DISCS, LEATHER
Graton & Knight Mfg. Co., Montreal.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Berlin, Can.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Limited, Galt, Ont.

DRIFT BOLT CUTTERS
Cleveland Pneumatic Tool Co. of Canada, Toronto.

DRILL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Wells Brothers Co., Greenfield, Mass.

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Berlin, Can.
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.
A. R. Williams Machinery Co., Toronto.

DRILL SOCKETS
Modern Tool Co., Erie, Pa.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Canada Machinery Corporation, Galt, Ont.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
Amalgamated Machy. Corporation, Chicago, Ill.
John Bertram & Sons Co., Dundas.
Can. Blower & Forge Co., Berlin, Canada.
Canada Machinery Corporation, Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Dominion Machinery Co., Toronto.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Dominion Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Turner Machine Co., Danbury, Conn.

DRILLING MACHINES, SENSITIVE
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Amalgamated Machy. Corporation, Chicago, Ill.
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Can. Blower & Forge Co., Berlin, Ont.
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Berlin, Canada.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Berlin, Canada.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford.
H. W. Petrie, Toronto.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.

DRILLS, CORNER (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Berlin, Canada.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Lachapelle, J. D., & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.
A. R. Williams Machy. Co., Toronto.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Can. Fairbanks-Morse Co., Cleveland.
H. A. Drury Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Machine Co., New Bedford.
W. F. & John Barnes Co., Rockford, Ill.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, MULTIPLE SPINDLE
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.

DRILLS, PNEUMATIC
John F. Allen Co., New York.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Can. Blower & Forge Co., Berlin, Canada.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy Co., Montreal.
Peacock Bros., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy Co., Montreal.
Morse Twist Drill and Machine Co., New Bedford.

DRILLS, TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRYING APPLIANCES
Can. Blower & Forge Co., Berlin, Canada.
Sheldons, Ltd., Galt, Ont.

DRYING OUT BARRELS
Baird Machine Co., Bridgeport, Conn.

DUMP CARS
Can. Fairbanks-Morse Co., Montreal.
Jenckes Mach. Co., Sherbrooke, Que.

DUST SEPARATORS
Can. Blower & Forge Co., Berlin, Canada.
Sheldons, Ltd., Galt, Ont.

DUST ARRESTERS (FOR TUMBLING MILLS
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

DYNAMOS AND ELECTRICAL SUPPLIES
Can. Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
Lachapelle, J. D., & Co., Montreal, Que.
Lancashire Dynamo and Motor Co., Ltd., Toronto.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

ELEVATOR ENCLOSURES
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

ELEVATORS AND BUCKETS
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATING AND CONVEYING MACHINERY
Banfield, Edwin J., Toronto.
Can. Matthews Gravity Carrier Co., Toronto, Ont.

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

EMERY AND EMERY WHEELS
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
H. W. Petrie, Toronto.

EMERY WHEELS, DRESSERS AND STANDS
Gardner, Robt., & Son, Montreal.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.

ENGINES, BALANCED VALVE
Plessisville Foundry Co., Plessisville, Que.

ENGINES, GAS AND GASOLINE
Can. Fairbanks-Morse Co., Montreal.
Lachapelle, J. D., & Co., Montreal, Que.
H. W. Petrie, Toronto.

ENGINES, HORIZONTAL AND VERTICAL
Can. Blower & Forge Co., Berlin, Canada.
Jenckes Mach. Co., Sherbrooke, Que.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

ENGINEERS AND CONTRACTORS
Lachapelle, J. D., & Co., Montreal, Que.
Mechanical Engineering Co., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

ENGINEERING BOOKS
The MacLean Publishing Co., Ltd., Toronto.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ENGRAVING MACHINES
Geo. Gorton Machine Co., Racine, Wis.

ESCUTCHEON PINS
Parmenter & Bulloch Co., Gananoque.

EVAPORATORS' MACHINERY
Brown, Boggs & Co., Hamilton, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Berlin, Canada.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
Can. Buffalo Forge Co., Montreal.
H. W. Petrie, Toronto.

FACING MACHINES FOR SHELL PLUGS
Brown Engineering Corp., Toronto.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Berlin, Canada.
Peacock Bros., Montreal, Que.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

FAUCETS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FENCE, IRON FACTORY
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

FILES
Aikenhead Hardware Co., Toronto, Ont.
Delta File Works, Philadelphia, Pa.
Nicholson File Co., Port Hope, Ont.

FIRE ESCAPES
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

FISH PLATES
Can. Steel Foundries, Ltd., Montreal, Que.

FLEXIBLE SHAFTS
Stow Mfg. Co., Binghamton, N.Y.

FLUMES
Toronto Iron Works, Ltd., Toronto.

FOOT VALVES
Smart-Turner Mach. Co., Hamilton.

FORGES, HAND, ETC.
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Berlin, Canada.
Sheldons, Limited, Galt, Ont.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE
Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Billings & Spencer, Ltd., Welland.
Dominion Forge & Stamping Co., Walkerville, Ont.
McKay, James Co., Pittsburgh, Pa.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
J. H. Williams Co., Brooklyn, N.Y.

FORGING HAMMERS, BELT-DRIVEN
Bliss, E. W., Co., Brooklyn, N.Y.
Peacock Bros., Montreal, Que.
Williams Co., J. H., Brooklyn, N.Y.

FORGING HAMMERS, STEAM OR AIR
Erie Foundry Co., Erie, Pa.

FORGING MACHINERY
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Erie Foundry Co., Erie, Pa.
National Machinery Co., Tiffin, Ohio.
H. W. Petrie, Toronto.

FRICTION CLUTCH PULLEYS, ETC.
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
H. W. Petrie, Toronto.
Positive Clutch & Pulley Works, Toronto.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FURNACES, ANNEALING, ETC.
Can. Hoskins, Ltd., Walkerville, Ont.
Lachapelle, J. D., & Co., Montreal, Que.
Mechanical Engineering Co., 55 Cote Street, Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

FURNACES, BLAST
Toronto Iron Works, Ltd., Toronto.

FURNACES, HEAT TREATING, HARDENING AND TEMPERING
Can. Hoskins, Ltd., Walkerville, Ont.
Mechanical Engineering Co., 55 Cote Street, Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

FURNACES, FORGING
Mechanical Engineering Co., Montreal.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

FURNACES FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Mechanical Engineering Co., Montreal.
Oven Equipment & Mfg. Co., New Haven, Conn.

FURNACE LINING
Mechanical Engineering Co., Montreal.

FUSE BOXES, STEEL
Dominion Forge & Stamping Co., Walkerville Ont.

FUSE CAP MACHINERY
Noble & Westbrook Mfg. Co., Hartford, Conn.

GALVANIZING MACHINERY
Erie Foundry Co., Erie, Pa.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.

GAS BLOWERS AND EXHAUSTERS
Can. Blower & Forge Co., Berlin, Canada.
Sheldons, Limited, Galt.

GAS MACHINES
Brown, Boggs & Co., Hamilton, Can.

GAS PRODUCER PLANTS
Can. Fairbanks-Morse Co., Montreal

GAUGES, HYDRAULIC PRESSURE
Charles F. Elmes Eng. Works, Chicago.

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn.
Worth Engineering Co., Toronto, Ont.

GEAR BLANKS
Brown Engineering Corp., Toronto, Ont.
Can. Steel Foundries, Ltd., Montreal, Que.

GEAR-CUTTING MACHINERY
Dominion Machinery Co., Toronto.
Hamilton Gear & Machine Co., Toronto.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.
The Smart-Turner Machine Co., Hamilton.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.

GEARS, CUT, MORTISE, ANGLE, WORM
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.

GEARS, RAWHIDE
Hamilton Gear & Machine Co., Toronto.
Gardner, Robt. & Son, Montreal.
Grant Gear Works, Boston, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.

GENERATORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Dominion Machinery Co., Toronto.
Lancashire Dynamo and Motor Co., Ltd., Toronto.
H. W. Petrie, Toronto.
Toronto and Hamilton Electric Co., Hamilton.
A. R. Williams Machy Co., Toronto.

GRAIN FOR POLISHING
Norton Co., Worcester, Mass.

GRAPHITE
Aikenhead Hardware Co., Toronto, Ont.

GRAVITY CARRIERS
Can. Matthews Gravity Carrier Co., Toronto, Ont.

GREASES (SEE LUBRICANTS)

GRINDERS, AUTOMATIC KNIFE
W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.

GRINDERS, CENTRE, PEDESTAL AND BENCH
Blake & Johnson Co., Waterbury, Conn.
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Gray Mfg. & Machine Co., Toronto.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

GRINDERS, CUTTER
Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

GRINDERS, DIE CHASER
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Gardner Machine Co., Beloit, Wis.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
United States Electric Tool Co., Cincinnati, O.

GRINDERS, CYLINDER, INTERNAL
Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Machine Co., Greenfield, Mass.
Modern Tool Co., Erie, Pa.
H. W. Petrie, Toronto.

GRINDERS FOR SHELL WORK
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

GINDERS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, PORTABLE, ELECTRIC, HAND TOOL, POST, FLOOR AND BENCH
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Machine Co., Greenfield, Mass.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machy. Co., Toronto.
Wisconsin Electric Co., Milwaukee, Wis.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Machine Co., Greenfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

GRINDERS, UNIVERSAL, PLAIN
Modern Tool Co., Erie, Pa.

GRINDERS, VERTICAL SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.

GRINDING MACHINES FOR SHELL PLUGS
Brown Engineering Corp., Toronto.

GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

GRINDING WHEELS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Carborundum Co., Niagara Falls.
Foss & Hill Machy. Co., Montreal.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.

GUARDS, WINDOW AND MACHINE
Canada Wire & Iron Goods Co., Hamilton, Ont
Dennis Wire & Iron Works Co., Ltd., London, Canada.

HACK SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss & Hill Machy. Co., Montreal.
Racine Tool & Machine Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
Victor Saw Works, Ltd., Hamilton, Canada.

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto, Ont.
Garvin Machine Co., New York City.

HACK SAW MACHINERY
Peerless Machine Co., Racine, Wis.

HAMMERS, AIR
Erie Foundry Co., Erie, Pa.

HAMMERS, HIGH SPEED
High Speed Hammer Co., Rochester, N.Y.

HAMMERS, DROP AND BELT-DRIVEN
Beaudry & Co., 8 Oliver St., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canadian Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Plessisville Foundry Co., Plessisville, Que.
Toledo Machine & Tool Co., Toledo.

HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.

HAMMERS, POWER
Beaudry & Co., 8 Oliver St., Boston, Mass.
Erie Foundry Co., Erie, Pa.
Peacock Bros., Montreal, Que.

HAMMERS, PNEUMATIC
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
Peacock Bros., Montreal, Que.

HAMMERS, MARKING
Matthews, Jas. H. & Co., Pittsburgh, Pa.

HAMMERS, MOTOR-DRIVEN
Beaudry & Co., 8 Oliver St., Boston, Mass.

HAMMERS, NAIL MACHINES
Whitman & Barnes Mfg. Co., St. Catharines Ontario.

HAMMERS, STEAM
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
Peacock Bros., Montreal, Que.

HAND HOISTS AND TROLLEYS
Whiting Foundry Equipment Co., Harvey, Ill.

HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Montreal.

HANGERS
Baird Machine Co., Bridgeport, Conn.
Dodge Mfg. Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
H. W. Petrie, Toronto.
The Smart-Turner Machine Co., Hamilton.

HARDNESS TESTING INSTRUMENTS
Shore Instrument & Mfg. Co., New York.

HEATING AND VENTILATING ENGINEERS
Can. Blower & Forge Co., Berlin, Canada.
Sheldons, Ltd., Galt, Ont.

HEAT GAUGES, HARDENING AND ANNEALING
Shore Instrument & Mfg. Co., New York.

HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.

HINGES
London Bolt & Hinge Works, London, Ont.

HOISTING AND CONVEYING MACHINERY
Allen, John F., Co., New York, N.Y.
Jenckes Mach. Co., Sherbrooke, Que.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

HOISTS, CHAIN, ELECTRIC AND PNEUMATIC
Ford Chain Block & Mfg., Philadelphia, Pa.
Jenckes Mach. Co., Sherbrooke, Que.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

HOISTS, ELECTRIC
Darling Bros., Ltd., Montreal, Que.
Northern Crane Works, Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

HOLDERS, STEEL DIE FOR MARKING
Matthews, Jas. H. & Co., Pittsburg, Pa.

HOPPERS
Toronto Iron Works, Ltd., Toronto.

HOSE CLAMP TOOL
Cleveland Pneumatic Tool Co., of Canada, Toronto.

HOSE, PNEUMATIC
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.

HOLDERS FOR DIES AND DRILLS
Wells Brothers Company, Greenfield, Mass.

HYDRAULIC MACHINERY
Can. Boomer & Boschert Press Co., Montreal.
Dominion Machinery Co., Toronto.
Charles F. Elmes Eng. Works, Chicago.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.

INDICATORS, SPEED
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.

INDEX CENTRES
Fred C. Dickow, Chicago, Ill.
Garvin Machine Co., New York.

IRON ORE
Hanna & Co., M. A., Cleveland, O.

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O. Coaticook, Que.
H. W. Petrie, Toronto.
Zin-Ho Mfg. Co., Chicago.

JACKS, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.

JACKS, PNEUMATIC
Northern Crane Works, Walkerville.

JACKS, PIT AND TRACK
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

JIGS, TOOLS, ETC.
Coleman Fare Box Co., Toronto, Ont.
Hamilton Gear & Machine Co., Toronto.

KEY SEATERS
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
A. R. Williams Machy. Co., Toronto.

KILNS
Can. Blower & Forge Co., Berlin, Canada.
Sheldons, Limited, Galt, Ont.

LABELS AND TAGS
Matthews, Jas. H. & Co., Pittsburgh, Pa.

LABORATORIES, INSPECTION AND TESTING (SEE CHEMISTS)

LACERS, BELT (SEE BELT LACERS)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LATHE CHUCKS (SEE CHUCKS)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros., Tool Co., Chicago.
Hendey Machine Co., Torrington, Conn.
J. H. Williams Co., Brooklyn, N.Y.

LATHES, BENCH
W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.

LATHES, BAND TURNING
Jenckes Machine Co., Sherbrooke, Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Root & Van Dervoort Engineering Co., East Moline, Ill.

LATHES, ENGINE
Amalgamated Machy. Corporation, Chicago, Ill.
W. F. & John Barnes Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Bawden Machine Co., Toronto, Ont.
Edgar Bloxham, Inc., New York, N.Y.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Iron & Steel Co., Cincinnati, O.
Davenport Locomotive Works, Davenport, Iowa.
Dominion Machinery Co., Toronto.
Douglas, W. & B., Middletown, Conn.
Duff Mfg. Co., Pittsburgh, Pa.
Foss & Hill Machy. Co., Montreal.
Fisher, A.D., Mfg. Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Hendey Machine Co., Torrington, Conn.
Hepburn, John T., Ltd., Toronto, Ont.
Himoff Machine Co., New York.
Hyde Engineering Works, Montreal, Que.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Oliver Machinery Co., Grand Rapids, Mich.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Jenckes Mach. Co., Sherbrooke, Que.
H. W. Petrie, Toronto.

LATHES, SINGLE PURPOSE
Bertram, John, & Sons Co., Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal, Que.
Fisher, A.D., Mfg. Co., Toronto, Ont.
Hepburn, John T., Ltd., Toronto.
Himoff Machine Co., Inc., New York, N.Y.
Roelofson Mach. & Tool Co., Toronto, Can.
Root & Van Dervoort Engineering Co., East Moline, Ill.

LATHES, SCREW CUTTING
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Cincinnati Iron & Steel Co., Cincinnati, O.
Davenport Locomotive Works, Davenport, Iowa.
Dominion Machinery Co., Toronto.
Foss & Hill Machy. Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

LATHES, SPINNING
Bliss, E. W., Co., Brookln, N.Y.
Toledo Mach. & Tool Co., Toledo.

LATHES, TURRET AND SPEED
John Bertram & Sons Co., Dundas.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Cincinnati Iron & Steel Co., Cincinnati, O.
Fisher, A.D., Mfg. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Hepburn, John T., Ltd., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Oliver Machinery Co., Grand Rapids, Mich.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, Mass.

LIFTS, PNEUMATIC
Whiting Foundry Equipment Co., Harvey, Ill.

LINK BELTING
Can. Fairbanks-Morse Co., Montreal.
Graton & Knight Mfg. Co., Montreal.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LIQUID AIR
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

LOCOMOTIVE EQUIPMENT
Can. Locomotive Co., Kingston, Ont.
Davenport Locomotive Works, Davenport, Iowa.

LOCOMOTIVES
Can. Locomotive Co., Kingston, Ont.
Davenport Locomotive Works, Davenport, Iowa.

LUBRICANTS
Can. Economic Lubricant Co., Montreal.
Cataract Refineries Co., Toronto.

LUBRICATORS
Bowser & Co., Inc., S. F., Toronto.
Cincinnati Lubricant Pump Co., Cincinnati.
Roper, C. F., & Co., Hopedale, Mass.

MACHINERY DEALERS
Can. Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
Essley Machinery Co., Chicago, Ill.
Garlock-Machinery, Toronto.
Foss & Hill Machy. Co., Montreal.
New York Machinery Exchange, New York.
H. W. Petrie, Toronto.
Stocker, H. A., Machinery Co., Chicago, Ill.
A. R. Williams Machy. Co., Toronto.

MACHINERY GUARDS (SEE GUARDS)

MACHINE TOOL ATTACHMENTS
Newman Mfg. Co., Cincinnati, Ohio.

MACHINERY REPAIRS
Cunningham & Sons, St. Catharines, Ont.
Coleman Fare Box Co., Toronto, Ont.
Sumbling Mach. Co., W. H., Toronto, Ont.

MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES
Can. Fairbanks-Morse Co., Montreal.
Frank H. Scott, Montreal.
J. H. Williams & Co., Brooklyn, N.Y.

MANDRELS
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
McCrosky Reamer Co., Meadville, Pa.
Morse Twist Drill & Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES
Matthews, Jas. H., & Co., Pittsburg, Pa.
Pritchard-Andrews Co. of Canada, Ottawa, Ont.

MARINE ENGINES
Cunningham & Sons, St. Catharines, Ont.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Perrin, Wm. R., Toronto.

MARQUISES
Dennis Wire & Iron Works, London, Ont.

MEASURING TAPES AND RULES
James Chesterman & Co., Ltd., Sheffield, Eng.

METALLURGISTS
Can. Inspection & Testing Laboratories, Ltd., Montreal.
Toronto Testing Laboratory, Ltd., Toronto.

METALS
Canada Metal Co., Toronto, Ont.
Lovetz, Louis, Toronto, Ont.
L. S. Tarshis & Sons, Montreal.

METAL SPECIALTIES
Acton Tool & Stamping Co., Toronto, Ont.
Coleman Fare Box Co., Toronto, Ont.

MILL MACHINERY
Cunningham & Sons, St. Catharines.
Alexander Fleck, Ltd., Ottawa.

MILLING ATTACHMENTS
John Bertram & Sons Co., Dundas.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Hendey Mach. Co., Torrington, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Brown & Sharpe Mfg. Co., Providence.
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Gooley & Edlund, Cortland, N.Y.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Edgar Bloxham, Inc., New York, N.Y.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Cook, Asa S., Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Tabor Mfg. Co., Philadelphia, Pa.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Modern Tool Co., Erie, Pa.
Peacock Bros., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Jenckes Mach. Co., Sherbrooke, Que.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.
A. R. Williams Machy. Co., Toronto.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Dominion Machinery Co., Toronto.
Fisher, A.D., Mfg. Co., Toronto, Ont.
Lachapelle, J. D., & Co., Montreal, Que.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co., of Canada, Toronto.

MUFFLERS
Dominion Forge & Stamping Co., Walkerville, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

NOZZLES, SPRAY
Can. Blower & Forge Co., Berlin, Canada.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.

NUT TAPPERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy Co., Tiffin, O.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
D'Olier Centrifugal Pump & Machine Co., Philadelphia, Pa.
Peacock Bros., Montreal, Que.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., Hamilton.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

OIL AND WASTE RECLAIMING MACHINES
D'Olier Centrifugal Pump & Machine Co., Philadelphia, Pa.

ORNAMENTAL BRASS, BRONZE AND STEEL WORK
Newman Mfg. Co., Cincinnati, Ohio.

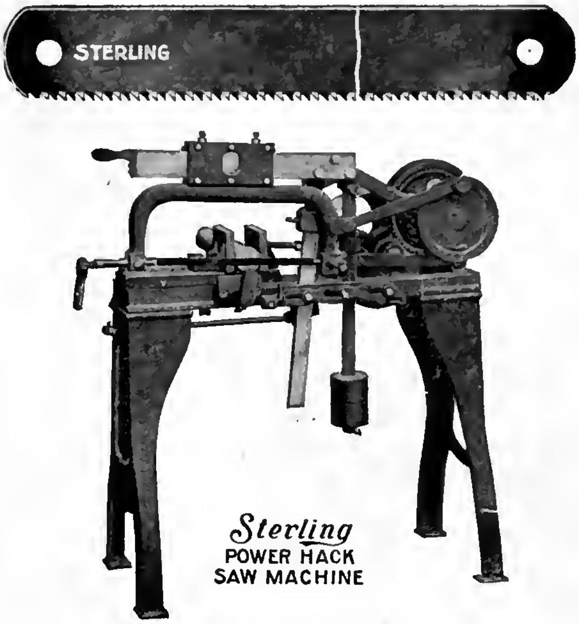
Don't Keep It--Sell It!

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor
or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

"STERLING" HACK SAWS



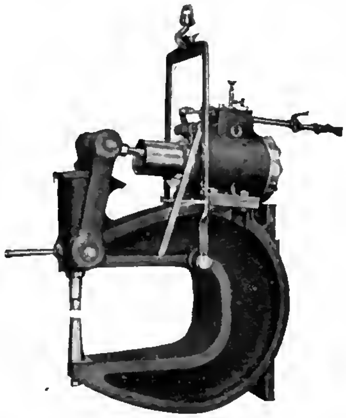
MANUFACTURED BY

DIAMOND SAW & STAMPING WORKS

BUFFALO, N.Y., U.S.A.

ALLEN Portable Pneumatic RIVETER

will give you the *Fastest* and *Tightest* Riveting at the Lowest Cost.



Special riveters designed to meet all requirements.

Send for Illustrated Catalogue.

Also Manufacturers of High-grade Coal Handling and Hoisting Machinery.

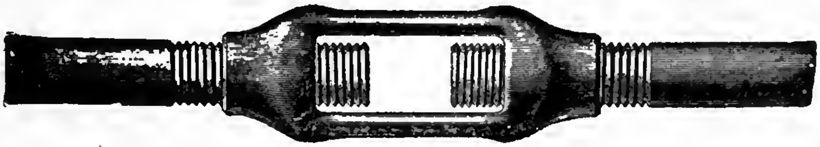
JOHN F. ALLEN COMPANY, (Established 1872)

370-372 Gerard Avenue, NEW YORK, U.S.A.

Liebers and W. U. Codes, "Riveter."

AGENTS—**Canadian Ingersoll-Rand Co., Ltd.,** Toronto, Ont.; Montreal, Que.; Winnipeg, Man.; Vancouver, B.C.; Sydney, N.S.; Cobalt, Ont.; Lethbridge, Alta.; Nelson, B.C.; So. Porcupine

Plyers, Structural Wrenches, Track Wrenches, Machine Wrenches, Eye Bolts, Lathe Dogs, Journal Box Wedges, Etc.



B
TRADE MARK

All Kinds Of Special Drop Forgings

Send Models or Blue Prints for Estimates

WRITE FOR CATALOG

Canadian Billings & Spencer, Limited, Welland, Ontario

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELLING, JAPANNING AND LACQUERING
Geo. Gorton Machine Co., Racine, Wis.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVEN TRUCKS, STEEL
Oven Equipment & Mfg. Co., New Haven, Conn.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
Oven Equipment & Mfg. Co., New Haven, Conn.

OXY-ACETYLENE WELDING AND CUTTING
Carter Welding Co., Toronto.
Coleman Fare Box Co., Toronto, Ont.
Toronto Welding Co., Toronto, Ont.

OXY-ACETYLENE WELDING AND CUTTING PLANTS
Carter Welding Co., Toronto, Ont.
Lachapelle, J. D., & Co., Montreal, Que.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Indianapolis, Ind.

OXYGEN (SEE ACETYLENE)

PACKINGS, LEATHER, HYDRAULICS, ETC.
Graton & Knight Mfg. Co., Montreal.
William R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.

PAINT SPRAYERS
Eureka Pneumatic Spray Co., New York, N.Y.

PAINTING MACHINES.
Eureka Pneumatic Spray Co., New York, N.Y.

PANS, LATHE
Cleveland Wire Spring Co., Cleveland.

PANS, STEEL SHOP
Cleveland Wire Spring Co., Cleveland.

PAPER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

PATENT SOLICITORS
Babcock & Sons, Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Ross Thomson & Co., Ottawa, Ont.

PATTERNS
Galt Malleable Iron Co., Galt.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton.

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PIPE CUTTING AND THREADING MACHINES
Armstrong Mfg. Co., Bridgeport, Conn.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.

PIPE CUTTERS, ROLLING
Armstrong Mfg. Co., Bridgeport, Conn.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
John H. Hall & Sons, Ltd., Brantford, Ont.

PIPE, RIVETED STEEL
Toronto Iron Works, Ltd., Toronto.

PLANER DRIVES, ELECTRICAL
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Niles-Bement-Pond Co., New York.

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Dominion Machinery Co., Toronto.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Oliver Machy. Co., Grand Rapids, Mich.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Berlin, Canada.
Sheldons, Ltd., Galt, Ont.

PLIERS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Billings & Spencer, Ltd., Welland.

PLUG MILLERS
Banfield, Edwin J., Toronto.

PNEUMATIC TOOLS
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo. Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.

PORTABLE VISE STANDS
New Britain Machine Co., New Britain, Conn.

POWER PLANT EQUIPMENT
Can. Fairbanks-Morse Co., Montreal.

PRESS SCREW (ADJUSTABLE)
W. F. & John Barnes Co., Rockford.
Wm. R. Perrin, Ltd., Toronto.

PRESSES, ARBOR
Atlas Press Co., Kalamazoo, Mich.

PRESSES, BANDING
Chapman Double Ball-Bearing Co., Toronto, Ont.
Perrin, Wm. R., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

PRESSES, HAND FORCING
Atlas Press Co., Kalamazoo, Mich.

PRESSES, BROACHING
E. W. Bliss Co., Brooklyn, N.Y.
Toledo Machine & Tool Co., Toledo.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Toledo Machine & Tool Co., Toledo, O.

PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Can. Boomer & Boschert Press Co., Montreal.
Can. Locomotive Co., Kingston, Ont.
Charles F. Elmes Eng. Works, Chicago.
Dominion Machinery Co., Toronto.
Foss & Hill Machy. Co., Montreal.
William R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.
West Tire Setter Co., Rochester, N.Y.

PRESSES, DROP
W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Boomer & Boschert Press Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Toledo Machine & Tool Co., Toledo.

PRESSES, FILTER
Lymburner, Ltd., Montreal.
Wm. R. Perrin, Ltd., Toronto.

PRESSES, FORGING
Can. Boomer & Boschert Press Co., Montreal.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Charles F. Elmes Eng. Works, Chicago, Ill.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Wm. R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo.

PRESSES, HYDRAULIC
Bawden Machine Co., Toronto, Ont.
Can. Boomer & Boschert Press Co., Montreal.
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago, Ill.
Dominion Machy. Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo.
A. R. Williams Machy. Co., Toronto.

PRESSES, PNEUMATIC
Toledo Machine & Tool Co., Toledo.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Can. Boomer & Boschert Press Co., Montreal.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Geo. Gorton Machine Co., Racine.
William R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo.
A. R. Williams Machy. Co., Toronto.

PRESSES, SCRAP BALING
Can. Boomer & Boschert Press Co., Montreal.
William R. Perrin, Ltd., Toronto.

PRESSES, SPRING FOOT
Baird Machine Co., Bridgeport, Conn.
Toledo Machine & Tool Co., Toledo.
Brown, Boggs & Co., Hamilton, Can.

PRESSES, SCREW
Can. Boomer & Boschert Press Co., Montreal.
Wm. R. Perrin, Ltd., Toronto.

PRESSES, TRIMMING
Erie Foundry Co., Erie, Pa.

PRESSURE REGULATORS
Can. Fairbanks-Morse Co., Montreal.

PULLERS, WHEEL
The Crane Puller Co., Arlington, Mass.

PULLEYS
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
Dodge Mfg. Co., Toronto, Ont.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
H. W. Petrie, Toronto.
Positive Clutch & Pulley Works, Ltd., Toronto.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

PULLEY MACHINERY, DRILLING AND TAPPING
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.

PUMPS, AIR
Bawden Machine Co., Toronto, Ont.
Darling Bros., Ltd., Montreal, Que.
Jenckes Mach. Co., Sherbrooke, Que.
Peacock Bros., Montreal, Que.
Smart-Turner Mach. Co., Hamilton.

PUMPS, CENTRIFUGAL
Can. Blower & Forge Co., Berlin, Canada.
Darling Bros., Ltd., Montreal, Que.
D'Olier Centrifugal Pump & Machine Co., Philadelphia, Pa.
Peacock Bros., Montreal, Que.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

PUMPS, HIGH PRESSURE
Charles F. Elmes Eng. Works, Chicago.
Darling Bros., Ltd., Montreal, Que.
Peacock Bros., Montreal, Que.
William R. Perrin, Ltd., Toronto.
Smart-Turner Mach. Co., Hamilton.

PUMPS, ALL KINDS
Bawden Machine Co., Toronto, Ont.
Can. Blower & Forge Co., Berlin, Canada.
Charles F. Elmes Eng. Works, Chicago.
Darling Brothers, Montreal.
William R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

PUMPS, HYDRAULIC
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Darling Brothers, Montreal.
Peacock Bros., Montreal, Que.
Smart-Turner Mach. Co., Hamilton.
Wm. R. Perrin, Ltd., Toronto.

PUMPS, LUBRICANT AND OIL
Cincinnati Lubricant Pump Co., Cincinnati, Ohio.
Roper, C. F., Co., Hopedale, Mass.

PUMP LEATHERS
Graton & Knight Mfg. Co., Montreal.

PUNCHES AND DIES
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Berlin, Canada.
Can. Fairbanks-Morse Co., Montreal.
Coleman Fare Box Co., Toronto, Ont.
Scott Bros., Halifax, Eng.
Gardner, Robt., & Son, Montreal.
Globe Machine & Stamping Co.
A. B. Jardine & Co., Hespeler, Ont.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.

PUNCHES, POWER
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

PUNCHES, PNEUMATIC
Jno. F. Allen Co., New York.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Peacock Bros., Montreal, Que.
Niles-Bement-Pond Co., New York.

PYROMETERS
Canadian Hoskins, Limited, Walkerville, Ont.
Peacock Bros., Montreal, Que.
Shore Instrument & Mfg. Co., New York City.
Thwing Instrument Co., Philadelphia, Pa.

QUARTERING MACHINES
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

RAILING, IRON AND BRASS (SEE GUARDS)

RAIL BENDERS
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.

RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.

RAW HIDE PINIONS (SEE GEARS)

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
McCrosky Reamer Co., Meadville, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wells Brothers Co., Greenfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
McKenna Bros. Brass Co., Pittsburgh.

REAMERS, PIPE, CYLINDER AND LOCOMOTIVE
Morse Twist Drill & Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Tool Co., of Canada, Toronto.

RECORDING INSTRUMENTS
Bristol Co., Waterbury, Conn.
Lachapelle, J. D., & Co., Montreal, Que.
Peacock Bros., Montreal, Que.

RIVET MACHINES
Can. Blower & Forge Co., Berlin, Canada.
Cook, Asa S., Co., Hartford, Conn.
National Machinery Co., Tiffin, O.

RIVETS, TUBULAR, BIFURCATED
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Jno. F. Allen Co., New York.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

RIVETING MACHINES, ELASTIC ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.

ROLLS, BENDING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.

ROLLS, CRUSHING
Jenckes Mach. Co., Sherbrooke, Que.

RUBBER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

SAND BLASTS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Gray Mfg. & Machy. Co., Toronto, Ont.

SAND BLAST SYSTEMS
Whiting Foundry Equipment Co., Harvey Ill.

SANDING MACHINES
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Gardner, Robt. & Son, Montreal.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

SAWS, CIRCULAR METAL
H. A. Drury Co., Montreal.
Hunter Saw & Machine Co., Pittsburg, Pa.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (SEE HACK SAWS)

SAWS, INSERTED TOOTH
Tabor Mfg. Co., Philadelphia, Pa.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York City.

SCRAP IRON
Lovitz, Louis, Toronto, Ont.
L. S. Tarshis & Sons, Montreal.

SCREW MACHINE PRODUCTS
Milholland, W. K., Co., Indianapolis.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler.
Milholland, W. K., Co., Indianapolis, Ind.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

SCREW MACHINES, MULTIPLE SPINDLE
New Britain Machine Co., New Britain, Conn
Windsor Machine Co., Windsor, Vt.

SCREWS
Galt Machine Screw Co., Galt, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
Can. Tap & Die Co., Galt, Ont.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford.
Wells Brothers Co., Greenfield, Mass.

SCREW SLOTTERS
Cook, Asa S., Co., Hartford, Conn.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

SECOND-HAND MACHINERY
Dominion Machinery Co., Toronto.
Essley Machinery Co., Chicago, Ill.
Gardner, Robt. & Son, Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt. & Son, Montreal.
New York Machinery Co., New York.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Plessisville Foundry Co., Plessisville, Que.
The Smart-Turner Machine Co., Hamilton.
H. A. Stocker Co., Chicago, Ill.
Union Drawn Steel Co., Hamilton.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto, Ont.
Allen Mfg. Co., Hartford, Conn.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Hendey Machine Co., Torrington, Conn.
H. W. Petrie, Toronto.
Steptoe, The John Co., Cincinnati, Ohio.

SHAFTING
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Dodge Mfg. Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
A. R. Williams Machy. Co., Toronto.

SHARPENING STONES
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

SHAVINGS, SEPARATORS
Can. Blower & Forge Co., Berlin, Canada.
Sheldons, Ltd., Galt, Ont.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams, Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
A. B. Jardine & Co., Hespeler.
Niles-Bement-Pond Co., New York.
Scott Bros., Halifax, England.
Toledo Machine & Tool Co., Toledo.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Berlin, Canada.
Canada Machinery Corp., Galt, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Scott Bros., Halifax, England.
H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo.

SHEARS, PNEUMATIC
John F. Allen Co., New York.
Toledo Machine & Tool Co., Toledo, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Fisher, A.D., Mfg. Co., Toronto, Ont.
Steel Bending Brake Works, Ltd., Chatham, Ont.

SHEET METAL STAMPINGS
Acton Tool & Stamping Co., Toronto, Ont.
Coleman Fare Box Co., Toronto, Ont.
Dominion Forge & Stamping Co., Walkerville, Ont.

SHELL BANDING MACHINES, HYDRAULIC
Can. Locomotive Co., Kingston, Ont.
Lymburner, Ltd., Montreal.
Perrin, Wm. R., Toronto.
West Tire Setter Co., Rochester, N.Y.

SHELL PAINTING MACHINE
Can. Blower & Forge Co., Berlin, Canada.
Can. Locomotive Co., Kingston, Ont.

SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn.

SHRAPNEL SHELL MARKER
Brown-Boggs Co., Hamilton, Ont.
Noble & Westbrook Mfg. Co., Hartford, Conn.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.

SILVER SOLDER
Geo. H. Lees & Co., Hamilton, Ont.

SIRENS, ELECTRIC
Sheldons, Ltd., Galt, Ont.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

SLOTTERS
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.

SMOKESTACKS.
MacKinnon, Holmes Co., Sherbrooke, Que.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
J. H. Williams Co., Brooklyn, N.Y.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Can.

SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPECIAL MACHINERY
Acton Tool & Stamping Co., Toronto, Ont.
Armstrong Bros., Toronto.
Banfield, Edwin J., Toronto.
W. H. Banfield & Sons, Toronto.
John Bertram & Sons Co., Dundas.
Baird Machine Co., Bridgeport, Conn.
Bawden Machine Co., Toronto, Ont.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Brown Engineering Corp., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Coleman Fare Box Co., Toronto, Ont.
Cunningham & Sons, St. Catharines, Ont.
Charles F. Elmes Eng. Works, Chicago.
Fisher, A.D., Mfg. Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn
John H. Hall & Sons, Brantford.
Himoff Machine Co., New York, N.Y.
Jardine, A. B., & Co., Hespeler.
Jenckes Mach. Co., Sherbrooke, Que.
D. McKenzie Machinery Co., Guelph, Ont.
Peacock Bros., Montreal, Que.
Root & Van Dervoort Engineering Co., East Moline, Ill.
Smart-Turner Machine Co., Hamilton, Ont.
William R. Perrin, Ltd., Toronto.

SPIKE MACHINES
The Smart-Turner Machine Co., Hamilton.

SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont.

SPRING COILERS
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.

SPRINGS, MACHINERY
Barnes, Wallace, Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

STAMPINGS
Coleman Fare Box Co., Toronto, Ont.
Dominion Forge & Stamping Co., Walkerville, Ont.

STAMPING MACHINERY
Coleman Fare Box Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.

STAMPS, STEEL ALPABETS AND FIGURES
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
H. W. Petrie, Toronto.
Peacock Bros., Montreal, Que.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

STEEL ALLOY (SEE ALLOYS, STEEL)

STEEL BENCH LEGS
New Britain Machine Co., New Britain, Conn.

STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.

STEEL, CARBON, FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.

STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Berlin, Canada.
Can. Fairbanks-Morse Co., Montreal.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Deloro Mining & Reduction Co., Deloro, Ont.
H. A. Drury Co., Ltd., Montreal.
Hawkridge Bros. Co., Boston, Mass.
H. W. Petrie, Toronto.
Vanadium Alloys Steel Co., Pittsburg, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Young, Corley & Dolan, Inc., New York, N.Y.

STEEL DIE ENGRAVING
Noble & Westbrook Mfg. Co., Hartford, Conn.

STEEL MACHINERY
Hawkridge Bros. Co., Boston, Mass.

STEEL VANADIUM
Drury, H. A., Co., Montreal, Que.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa.

STELLITE, HIGH-SPEED TOOL METAL
Deloro Mining & Reduction Co., Deloro, Ont.
B. K. Morton Co., Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain Conn

STOCKS FOR DIES
Armstrong Manufacturing Co., Bridgeport, Conn.
Wells Bros. Co., Greenfield Mass.

STOCKS, PIPE
Armstrong Manufacturing Co., Bridgeport, Conn.
Butterfield & Co., Rock Island, Que.

STOOLS, STEEL, SHOP
Dennis Wire & Iron Works Co., Ltd., London, Canada

STRAIGHT EDGES
Steel Bending Brake Works, Ltd., Chatham, Ont.

STRAIGHTENING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland

STUD DRIVER
Keystone Mfg. Co., Buffalo, N.Y.
D'Olier Centrifugal Pump & Machine Co., Phila.

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TANKS, GASOLINE AND OIL
Bowser, S. F., & Co., Inc., Toronto, Ont.
Dominion Forge & Stamping Co., Walkerville, Ont.

TANKS, STEEL, WATER PRESSURE
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto.

TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Toronto Iron Works, Ltd., Toronto.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.

TAPPING MACHINES (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

TAPPING MACHINES AND ATTACHMENTS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
Greenfield Tap & Die Corporation, Greenfield, Mass.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.

TAP CHUCKS
Wells Bros., Greenfield, Mass.

TAPS, ADJUSTABLE
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.

TAPS, COLLAPSIBLE
Geometric Tool Co., New Haven, Conn.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal
Can. Tap & Die Co., Galt, Ont.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven, Conn.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford.
Murchey Machine & Tool Co., Detroit.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Brothers Co., Greenfield, Mass.

TECHNICAL BOOKS
The MacLean Publishing Co., Ltd., Toronto.

TESTING INSTRUMENTS, METALLURGICAL
Shore Instrument & Mfg. Co., New York City.

TESTING LABORATORIES
Can. Inspection & Testing Laboratories, Ltd., Montreal.
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Garvin Machine Co., New York.
Geometric Tool Co., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
National Machy. Co., Tiffin, Ohio.

THREADING MACHINES FOR SHELL PLUGS
Brown Engineering Corp., Toronto.

TIME CLOCKS
International Time Recording Co., Toronto.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Works, Ltd., Chatham, Ont.

TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

TIRE, WHEELS
Wells Bros. Co., Greenfield, Mass.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
J. H. Williams Co., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.

TOOL ROOM PARTITIONS
Can. Wire & Iron Goods Co., Hamilton.

TOOL STEEL
Aikenhead Hardware Co., Toronto, Ont.
Armstrong, Whitworth, Ltd., of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
H. A. Drury Co., Montreal.
Hawkridge Bros. Co., Boston, Mass.
H. W. Petrie, Toronto.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Young, Corley & Dolan, Inc., New York, N.Y.

TOOLS, BLACKSMITHS', ETC.
A. R. Williams Machy. Co., Toronto.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machy. Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, LATHE, PLANER AND SLOTTER
Armstrong Bros. Tool Co., Chicago.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal.

TRACK SYSTEMS
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Dodge Mfg. Co., Toronto, Ont.
Hamilton Gear & Mach. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co., Montreal.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Toronto.
F. Reddaway & Co., Montreal.
The Smart-Turner Machine Co., Hamilton.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TRUCKS, FACTORY, FREIGHT, ETC.
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURRET MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Root & Van Dervoort Engineering Co., East Moline, Ill.
Turner Machine Co., Ltd., Danbury, Conn.
Warner & Swasey, Cleveland, O.

TURRETS, TOOL POST AND TAIL STOCK
Jenckes Mach. Co., Sherbrooke, Que.
McCrosky Reamer Co., Meadville, Pa.
Newman Mfg. Co., Cincinnati, Ohio.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
Wm Kennedy & Sons, Ltd., Owen Sound, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Cook, Asa S., Co., Hartford, Conn.
A. B. Jardine & Co., Hespeler.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

VACUUM PUMPS
Can. Blower & Forge Co., Berlin, Canada.
Smart-Turner Machine Co., Hamilton, Ont.

VALVE LEATHERS
Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

VALVES, FOOT
Smart-Turner Mach. Co., Hamilton.

VALVES, HYDRAULIC
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.

VALVES, BACK PRESSURE, STEAM
Sheldons, Limited, Galt.

VENTILATING APPARATUS
Can. Blower & Forge Co., Berlin, Ont.
Sheldons, Limited, Galt.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Mfg. Company, Bridgeport, Conn.
Bignall & Keeler Mach. Works, Edwardsville, Ill.
Butterfield & Co., Rock Island, Que.
J. H. Williams Co., Brooklyn, N.Y.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WATER CINDER MILLS
Whiting Foundry Equipment Co., Harvey, Ill.

WATER TOWERS
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

WELDING MACHINES, ELECTRIC, ETC.
Tabor Mfg. Co., Philadelphia, Pa.

WELDING, WORK AND SUPPLIES (Autogenous and Oxy-Acetylene). SEE OXY-ACETYLENE

WHEELS, EMERY, CARBORUNDUM
Foss & Hill Machy. Co., Montreal.
H. W. Petrie, Toronto.

WINCHES
John H. Hall & Sons, Brantford.
Northern Crane Works, Walkerville.

WIRE COILING AND POINTING MACHINES
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton.
Dennis Wire & Iron Works Co., Ltd., London.

WIRE FORMING AND STAMPING MACHINERY
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.
Baird Machine Co., Bridgeport, Conn.

WIRE NAILS
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio
A. R. Williams Machy. Co., Toronto.

WIRE, RUBBER-COVERED
Lachapelle, J. D., & Co., Montreal.

WIRE, STEEL, BRASS, COPPER, BRONZE
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
H. W. Petrie, Toronto.

WOODWORKING MACHINERY
Can. Blower & Forge Co., Berlin, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
New Britain Machine Co., New Britain, Conn.
Oliver Machy. Co., Grand Rapids, Mich.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

WOOD LATHES
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

WOOD TRIMMERS.
Oliver Machy. Co., Grand Rapids, Mich.

WRENCHES
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. Co., Greenfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
J. H. Williams Co., Brooklyn, N.Y.

WRENCHES, AUTOMOBILE NARROW JAW AND MONKEY
Bemis & Call Hardware & Tool Co., Springfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, PIPE, MONKEY
Aikenhead Hardware Co., Toronto, Ont.
Bemis & Call Hardware & Tool Co., Springfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, RATCHET AND BASIN
Bemis & Call Hardware & Tool Co., Springfield, Mass.
Keystone Mfg. Co., Buffalo, N.Y.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.